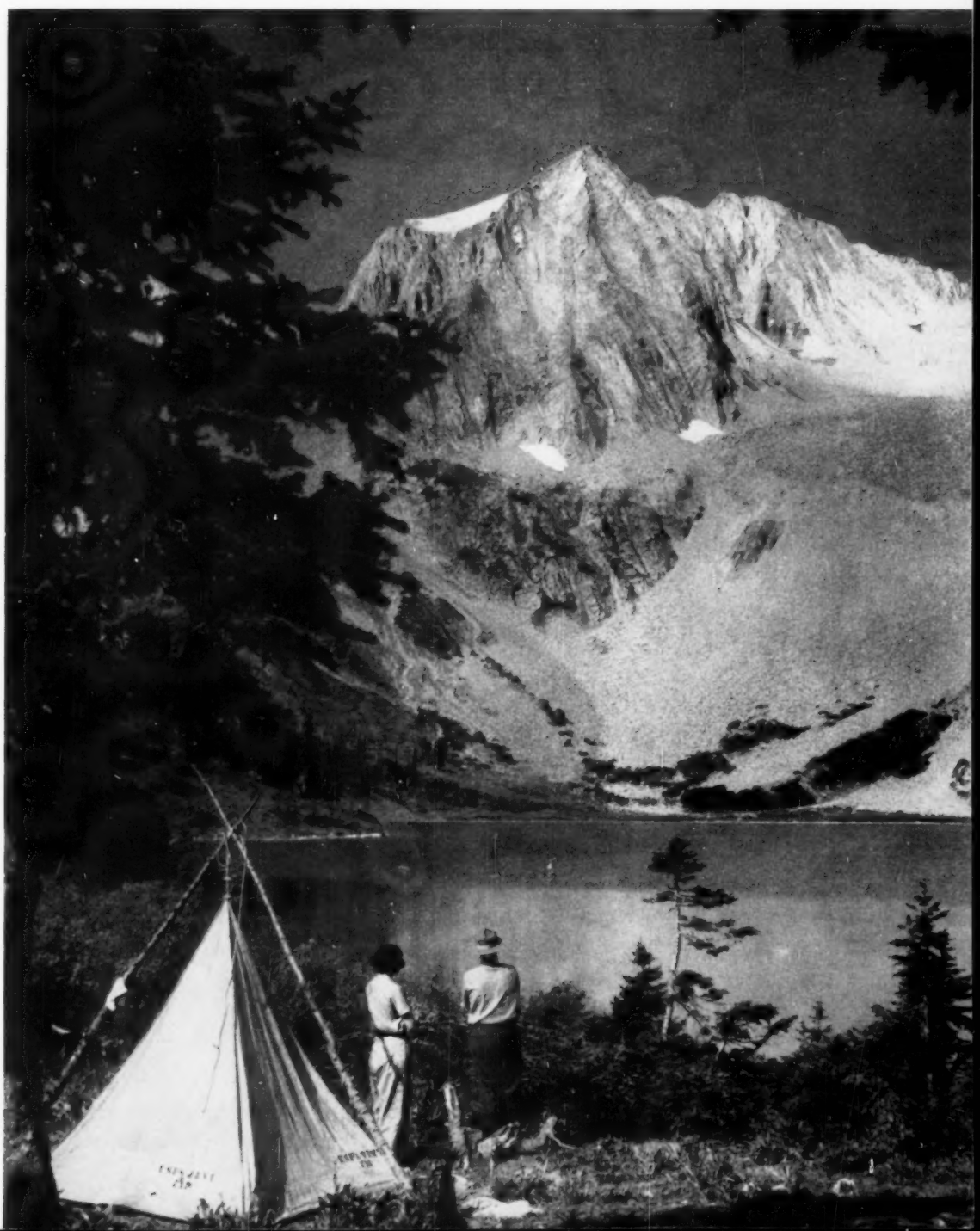
# Journal of FORESTRY

MAY 1956



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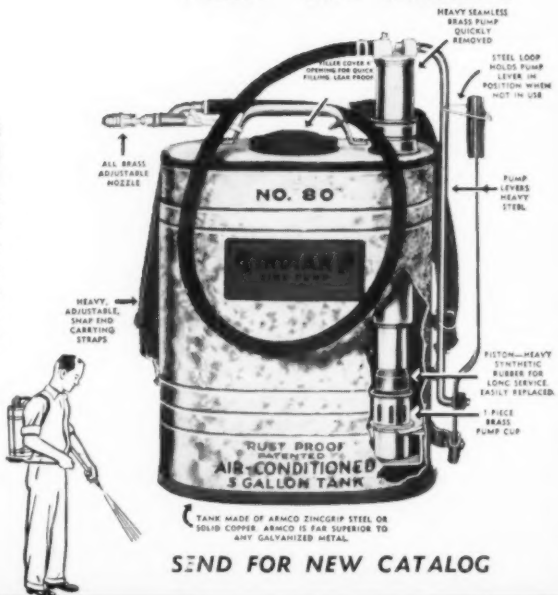
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# Journal of Forestry


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Journal of Forestry

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# Merchandising Southern Pine Lumber[1]

W. C. Hammerle
Executive secretary,
Southeastern Pine Marketing Institute,
Savannah, Georgia

"AMERICAN prosperity is built as much on marketing methods as on our techniques of production." The truth of that statement by a leading advertising executive is visible all around us every day. The appearance, packaging, availability, sales methods, servicing, advertising, reputation of the manufacturer and intermediate distributor are all factors of merchandising that create demand for a product. Production expansion is brought on by demand. Improved techniques of manufacture mainly result from efforts to meet competition. Modern merchandising creates and maintains demand for a product. It enables new, or variations of old, products to become strongly competitive with currently established products and can change the trend in buying habits.

All foresters are interested in and, in varying degree, are directly concerned with the development and production of our forest resources. Most of us are involved in the management and protection of forest lands and tree crops. Some are engaged in the harvesting of those crops; some in their utilization and manufacture into various products; and a few in their marketing and sale. Yet, all have a stake in what the forest industries and their intermediate distributors do in merchandising their diverse products to the ultimate consumer. The common denominator of interest is the value of standing timber.

[1]Paper presented at annual meeting. Southeastern Section, Society of American Foresters held at Montgomery, Ala., Jan. 21, 1956.

## Forestry Dependent on Markets

The landowner and forest manager look to the forest industries for their markets, while the industries look to the ultimate consumer of their manufactured products. Nothing is more fickle than the buying public and the term "traditional markets" has a fine sound but means little unless the manufacturer consistently meets and overcomes competition from similar and substitute products. Loss of markets restricts production and in turn the demand for raw material—in our case timber. This brings us back to the landowner and the forester. Without markets for his timber, there would be little incentive for the landowner to invest in the growing and management of forests. Restricted markets mean low stumpage values. The incentive is still there but in lesser degree than when demand is highly competitive. The tremendous upsurge, during the past fifteen years, in the stumpage price of timber for lumber, poles and piling, the high value stumpage, has provided the greatest incentive for the practice of forestry by all classes of private landowners.

There is, of course, another angle in relation to stumpage values. Excessively high stumpage prices may so increase product costs as to prohibit competitive pricing and cause loss of markets. In turn, stumpage values will decline. It is a factor which, along with others, is already affecting southern lumber manufacturers. But, what we are all interested in is stable markets for manufactured products, stable forest industries, equitable stumpage prices and increased forest production.

## The Southern Pine Industry

The southern pine lumber industry is one of the major industries in each of the southern states. It provides employment for a quarter of a million full and part-time workers of whom 93 percent are in direct production. Nearly a quarter of a billion dollars is expended annually for its raw material—the bulk of which is paid out to private landowners. In 1954, the output of southern pine lumber represented 21 percent of the nation's total lumber production and 23 percent of construction lumber requirements. In overall size it is big, but in composition it is not. The industry is comprised mainly of small-sized units with 98 percent of its mills producing under 5 million board feet annually, yet accounting for 72 percent of the total production.

The magnitude of its component parts and the highly individualistic character of its operating units result in an industry strongly competitive within itself and extremely resistant to consolidated, unified action. As a result a small segment of the industry carries the load of supporting action on industry-wide matters. This has handicapped the southern pine industry in many ways including the effective merchandising of its product. Here it must compete with large integrated corporations that are adequately financed for individual or organized group ac-

tion to conduct research, product development, and product merchandising to take over so-called traditional markets for lumber. Even in the lumber field itself, southern pine is faced with similar competition from other sections of the country.

### Lumber Market Trends

The favorable lumber market for the past 1½ years has again tended to make pine operators complacent about the market situation and the need for any concerted action to combat the merchandising efforts of competing materials. Yet, as late as 1953 and the first half of 1954 the southern pine market was in bad shape and lumbermen were seeking means to rebuild markets. The production of southern pine in 1953 was the lowest since 1945 and just barely above the average for the index years, 1935-39.

The pine lumber markets outside the South have been drastically curtailed and in some cases lost. Some of the contributing factors were: lower production cost and better merchandising of competing woods; inequalities in freight rates; poorly manufactured, improperly seasoned, or green southern pine; and a reduction in demand due to competing substitutes. Fifty-seven percent of southern pine production was marketed in northern and mid-western states in 1934. In 1954 only 27 percent of southern pine lumber moved out of the South.

Home building is the biggest market for southern pine, and lumber production rises and falls in relation to the volume of home construction. For the first ten months of 1955, the Bureau of Labor Statistics reports 1,161,000 new, nonfarm housing starts. This was an increase of 13.2 percent over the same period in 1954, and only 4.4 percent less than in the record breaking year of 1950. Industry statistics indicate that southern pine lumber production in the first ten months of 1955 was only 4.5 percent greater than for the corresponding period of 1954. The increase in pine production represented only one-third the increase in the volume of home construction—its biggest market.

This difference is significant from the standpoint of industry production and productive capacity. With all types of building construction continuing at an all time high, the use of lumber is not keeping pace. Two of the influencing factors are: the increasing use of other materials including other wood species, and changes in methods of construction which have greatly reduced the amount of lumber used in home construction. For example, the trend toward one-story homes and slab-on-ground foundation have reduced the amount of lumber used for sills, floor joists, and subflooring. Also, less lumber is being used for exterior wall construction. A Department of Labor survey for the first quarter of 1954 showed that in the southern region, with 34 percent of the nation's housing starts, only 76 percent of the exterior walls of one-family houses started were of frame construction. And, that wood facing was used on only one-third of these houses. Sheathing for exterior walls and roof is the big market for our "board" mills which account for a large percentage of pine production. It is a market that is dwindling fast primarily because of intensive merchandising efforts on substitute materials and bad marketing practices by some pine manufacturers.

The salvation of the southern pine industry to date has been the large scale industrial development and general economic expansion of the South and the nation as a whole. The South has provided the local market for pine lumber while the national demand has been such as to supply a broad enough market that competing materials have had no reason to concentrate in this section. There is no assurance this condition will remain static.

### Home Building—Key Market Challenge

The home builder and modernizer, the architect, the industrial engineer or designer, and the do-it-yourself man have never before had so many different kinds and brands of products from which to select. The lumber market is today faced with the strongest competition it has ever had from substitute materials. Materials, that are strongly competitive in cost, suitability, appearance, and utility, are being intensively promoted by the manufacturers directly with the consumer and through the the distributor and local supplier. The lumber industry can no longer take for granted the home building field as its market. There has been a constant decline in the volume of lumber used in home construction until, today, only about ten thousand board feet of lumber is used in the average home.

In a recent article on dealer advertising, the following statement appeared: "The dealer who cuts down on his advertising today 'because times are good' is automatically throwing customers and business into his competitors' laps." That statement applies equally as well to the manufacturer. But advertising alone is not enough. It is one part of the entire merchandising job which starts with the production of a quality product—designed for a particular use, correctly identified, backed by a reputable manufacturer, having an attractive appearance or packaging, produced at a reasonable cost and in sufficient quantity to supply created demand. Then distribution channels must be established and maintained, prompt delivery scheduled, and all phases of promotional advertising carried out. The latter includes pre-selling consumers and specifiers, promotional work with distributors and dealers, and backing the latter with cooperative local consumer advertising, educational promotion, and point-of-sale programs to develop effective retail selling. Merchandising ends with satisfied consumers.

That is an over-simplified description, but at least it emphasizes the fact that "order taking" is not merchandising. It indicates the

course that must be followed by the southern pine industry if established markets are to be retained and further developed against competition.

### Meeting the Challenge

The industry has the facilities and still has the opportunity to handle the job. Many individual operators have established well-earned reputations in quality and dependability of manufacture and distribution, and to some degree in marketing their product. They are, however, continually exposed to pressure from wholesalers and retail dealers to compete price-wise with inferior lumber; to eliminate grade and identification marking; and to ship partially seasoned lumber. They are also handicapped by the fact that individually they cannot supply sufficient quantity to support the market.

The task starts with the manufacturer in selecting the raw material and determining its utilization. Fortunately the quality of our timber has been constantly improving with the expansion of forest management. We are no longer dependent on the rapid growing, second-growth, old field pine of the 1930's with its inherent weaknesses. The timber is better and with proper selection the quality end product can be attained. Also necessary is care in manufacturing, better machining, correct seasoning, consistent and accurate grading, and packaging and shipping that will assure delivery of an attractive quality product. Even then, it may be good lumber but anonymity does not designate quality to the consumer. Quality and dependability can be denoted and the value of the product increased through the use of recognized grade marks, trade marks, and mill identification.

Lumber has many excellent qualities which lend themselves to effective sales promotion. But, there is a negative side to be overcome that has been effectively utilized by the manufacturers of substitute materials, namely: the experience of builders and consumers with poor quality, carelessly manufactured, unseasoned lumber whether of southern pine or other species. It is not enough to sell just lumber—quality must be the keyword. The need is to emphasize the quality features of southern pine; its superior properties and utility; the advantages of higher standards in manufacture, seasoning and grading; and to convince buyers that good southern pine is worth its cost. Integrity of manufacture and dependability of supply are component parts of the required promotional program.

It is essential that these selling points be intelligently and effectively presented—and consistently hammered home. Sporadic, emergency efforts when the market is off are of little value.

Product promotion with the ultimate consumer is an integral part of the southern pine industry's promotional activity and one that has been sadly neglected. This is especially true for the home building and improvement field where competing materials have been constantly selling their story to consumers. During the past year, the Southern Pine Association has made an effective entrance into this field. Such efforts should be strongly supported. Consumer advertising is broad scale and costly and as such is beyond the reach of the individual operator. In the case of the home buyer, it is a matter of education to change the buyer's attitude and overcome indifference. Primarily of future benefit, the industry is obliged to conduct consumer education or relinquish the field to competitive materials.

Of urgent concern is the industry's promotional action with the materials specifiers for all types of construction and use. Manufacturers of competing materials have really concentrated their promotion in this field. Advertisements in trade and professional magazines; regular, planned personal contacts; promotional displays; and assistance in direct selling through training, contests, and localized advertising have all been carried on. This is especially true in the home building and improvement field—still the biggest market for lumber. In this field concerted efforts are needed to sell southern pine to the materials specifiers, namely, the architect, contractor, operative builder, and retail lumber dealer. All of these are important but the key man is the retailer. To a great extent, the product and brand the dealer has in stock influences the material used. And, where the dealer is an operative builder, he exerts complete control over materials and brand specifications.

### Retailer—A Major Factor

The retail lumber dealer of today is a building materials merchant. Lumber is but one line in his stock which contains nearly all types of directly competing materials. The dealer is the key link in the lumber distribution chain to the final consumer. In reaching him the industry needs and should receive the assistance of the lumber wholesaler. These facts are recognized by the plywood industry whose distributors are raising a half million dollars for strictly local retail advertising of direct benefit to retail dealers. The extent to which the dealer merchandises southern pine lumber over other lumber species and other competitive materials may be influenced by several major factors: buyer demand; competitive price; margin of profit; quality of product; sales appeal; dependability of supply; manufacturer's service and cooperative relations;; and assistance rendered in merchandising the product both directly and indirectly.

The retail dealer is in a most advantageous position to perform a real service in rebuilding the reputation of southern pine. He must have the support and encouragement of the pine manufacturer to do so. The dealer should insist on quality southern pine, properly manufactured, machined, seasoned, and delivered in first class condition. He should specify that all lumber be grade-marked and mill-identified—and require compliance. Dealer advertising and point-of-

sale selling of the quality product, citing its advantages and how to identify it, will then bring the mills in line and recalcitrant dealer competition as well.

### Industry Must Take Initiative

Such an overall merchandising program is possible of achievement and offers substantial rewards in more stable and profitable markets. It does require that the industry take the initiative in merchandising its products. The individual operator can correct conditions and meet the requirements in manufacture and distribution. He can do a great deal in marketing his product and effectively distributing it. But the most he can do individually is to establish his own reputation and fill demand for his own product to the limit of productive capacity—as long as there is a demand for southern pine. Individually he cannot exert enough influence on the building market, for example, to offset the effects of inferior lumber and the skillfully organized and well financed campaigns of competitive materials.

The logical, effective answer to merchandising southern pine in a highly competitive market is consistent individual effort coupled with organized action. The means are available through the industry associations already operating on a regional or state basis. They are working toward the same goal and working together even though their respective programs vary slightly in approach. Here in the Southeast, our organization—the Southeastern Pine Marketing Institute—was organized to represent the responsible pine mills—small, medium and large—in carrying out the merchandising functions outlined through both individual and cooperative action. Our program is built on assurance of quality and dependability evidenced on each piece of lumber by the S.P.M.I. trademark, the mill name and the lumber grade-mark. Our efforts are presently concentrated on securing the recognition and support of wholesalers and retail dealers in our program and the product of our member mills.

Southern foresters as well as the lumber industry have a stake in merchandising southern pine lumber since success or failure will definitely affect the stumpage price of timber—the only realistic incentive for the practice of forestry on private lands.

## William Heritage Receives Department of the Interior Distinguished Service Award

In recognition of forty-four years of outstanding government service in the field of forest management, Mr. William Heritage, area forester of the Minneapolis area office of the Bureau of Indian Affairs since 1936 received the Department of the Interior Distinguished Service Award, Monday, March 12, 1956, at public convocation at Washington, D. C.

The award citation read in part as follows:

"Mr. Heritage was one of the early group organized in the Branch of Forestry to protect and manage the Indian forested lands. There were few precedents to guide the group in the creation of policy and formulation of regulations for conducting timber sales . . . The resulting General Timber Sale Regulations, approved in 1920, are in use today and remain virtually unchanged. In 1927 Mr. Heritage was made logging engineer at large and also served as production coordinator for the Central States during the life of the Indian Conservation Corps . . . The Menominee and Red Lake Sawmills and the Red Lake Fisheries which have been under his jurisdiction are among the most successful of all Indian enterprises. The development of the sawmills to their present prosperous state, coincident with the intensive degree of forest management now practiced on their respective forests, represents an achievement of high order. For his outstanding contributions to good forestry practices, his influence and guidance of coworkers, his fine relations with Indian people, and the prestige he has brought to the Branch of Forestry of the Bureau of Indian Affairs, the Department of the Interior bestows upon Mr. Heritage its highest honor, the Distinguished Service Award."

WILLIAM HERITAGE, *left*, shown receiving award from Wesley A. D'Ewart, Assistant Secretary of the Interior.

# Use of Temperature Pellets in Regeneration Research

**Roy R. Silen**
Pacific Northwest Forest and Range Experiment Station, Forest Service, U. S. Department of Agriculture, Portland, Oregon

HIGH TEMPERATURES at the ground surface are a major cause of seedling mortality for many conifers. Critical temperatures are believed to occur in a tissue-thin layer at the surface. From this layer, temperatures decrease greatly in the first few millimeters upward into the air and downward into the soil.[1,2] Losses of Douglas-fir seedlings begin when surface temperatures exceed 123° F.,[3,4] but the threshold is not sharp. Newly germinated seedlings of such thin-stemmed species as Douglas-fir and hemlock generally die at temperatures between 123° F. and 140° F., but occasional individuals that manage to escape heat injury early in the season may survive temperatures in excess of 150° F.

Until very recently it was difficult to measure temperatures in this thin line of surface heat. Available instruments were, moreover, costly and most investigations of soil surface temperatures were necessarily limited to a relatively few samples.

Commercial temperature pellets[5] are now available which in some ways are superior to more expensive instruments such as thermometers, thermographs, and thermocouples. They are cheap enough to permit extensive sampling, and they provide an accurate measure of the temperature in the hairline at the surface of the soil. They come in the form of 7/16-inch by 1/8-inch tablets which are inexpensive, accurate, insoluble, distinctively colored, generally waterproof for at least a year, easily fragmented to any desired size, and available in useful intervals of melting temperatures (113° F., 125° F., 138° F., 150°F., and 163° F., error ± 1 percent). Results of studies on natural seedbeds with many thousands of pellets over three seasons have shown them to be highly useful when there is need for maximum temperature records at about 12° intervals.

Many temperature-measuring instruments such as mercury thermometers and thermograph bulbs are so large that their readings actually represent an integration of a range of temperatures near the surface. Although fine thermocouples overcome this difficulty, they can conduct appreciable heat down the metal wires to cooler layers,[6] and may easily be installed or become shifted above or below the plane of highest temperature. The temperature pellet, in contrast, intersects the soil surface and provides an accurate record of the exact location of the plane where the temperature exceeds the melting point of the pellet. There is only slight conduction of heat through the pellet to cooler layers. These characteristics make the pellet a fine addition to the instruments commonly used for measuring surface soil temperatures.

If a partially buried pellet is exposed to sun's radiation, it will begin to soften in a thin line at the soil surface when the melting temperature is reached. Should the temperature then drop, the pellet will reharden, but a thin eroded line will remain etched on its surface as a record. If instead the temperature should continue upward, all the portion above the surface will melt, but the part below the surface will generally remain intact.

Pellets were first used by the author to provide a measure of seedbeds reaching lethal temperatures on Douglas-fir clearcutting within the H. J. Andrews Experimental Forest. A large number of sampling points within each clearcut area were first chosen at random or systematically. Pellet fragments of several melting temperatures were then placed at each point to provide a range of maximum temperatures. Since seedbed temperatures may vary considerably even over an inch of surface, the pellet with the most important melting temperature was placed on the exact point. On the H. J. Andrews Experimental Forest, pellets melting at 138° F. were used at the exact point because this temperature correlates best with heat loss of Douglas-fir seedlings. Fragments of pellets having higher or lower melting points were then placed ¼ to ¾-inch to the east and west. The east-west orientation of the line of pellet fragments was adopted to prevent toothpick markers on either end from shading the fragments.

In placing each pellet fragment, the spot was first prepared by probing the point of a pencil about one-half inch into the soil to form a small conical hole. The fragment was then inserted with tweezers, point first, so that only a third or less showed above the ground.

This procedure was followed for two reasons. Experience had shown that considerable movement

[1]Geiger, R. The climate near the ground. (2nd ed.) Harvard University Press, Cambridge, Mass. 1950.

[2]Smith, D. M. The influence of seedbed conditions on the regeneration of eastern white pine. Connecticut Agric. Expt. Sta. Bul. 545, 61 pp. Illus. 1951.

[3]Baker, F. S. Principles of silviculture. McGraw-Hill Book Co., Inc., New York. 44 pp. Illus. 1950.

[4]Isaac, L. A. Reproductive habits of Douglas-fir. Charles Lathrop Pack Forestry Foundation, Washington, D. C. 107 pp. Illus. 1953.

[5]TEMPILS sold by the Tempil Corporation, New York, New York, were used in these trials.

[6]Vaartaja, O. Temperature and evaporation at and near ground level on certain forest sites. Canadian Journal of Botany 32:760-783. 1954.

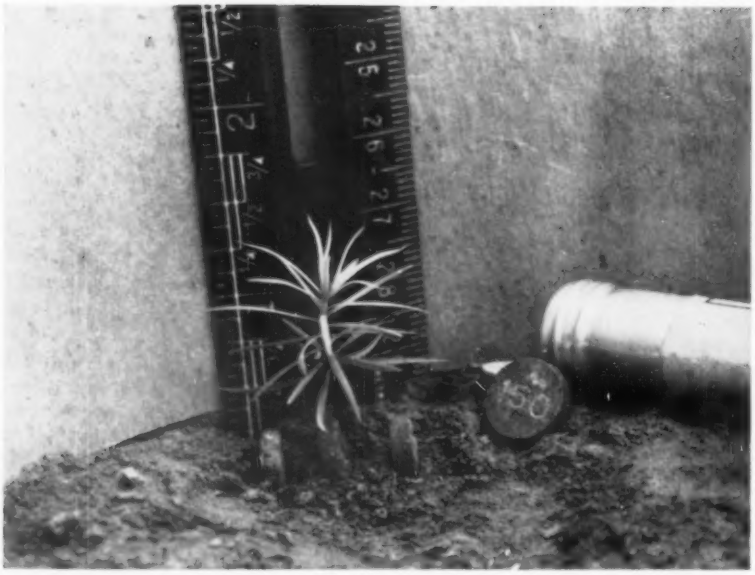

FIG. 1.—Temperature pellets installed near the stem of a Douglas-fir seedling. The 138° F. pellet fragment is closest to the stem; 125° F. and 150° F. fragments are on either side. Smaller splinter-like fragments would normally be used, but half pellets are shown here for clarity. Whole 150° pellets and their aluminum container are shown at right.

of soil particles and other small objects by rain, wind, gravity or biotic activity took place even on relatively flat surfaces during summer. This movement was much more pronounced on steep slopes. Pellet fragments merely placed on the surface often became lost, but partially buried fragments usually remained in place. In addition a pellet fragment partially buried would usually leave an unmelted portion below ground level to provide positive evidence that the surface temperature had exceeded the melting point of the pellet. Otherwise there was no certain way to determine whether the absence of a pellet meant it had completely melted, or had simply become lost.

Half pellets were the most satisfactory size of fragment when the tests were carried over several months. Whole pellets proved unnecessarily large for point sampling and fragments smaller than a half pellet took too long to find. The 125° F. pellet is an exception. When heated above its melting point, it partly vaporizes, leaving behind a black soot. This blackens the adjacent soil surface and may change the temperature characteristics of surface materials. For this reason, a small fragment (¼-pellet or smaller) of the 125° F. pellet was used and was placed at least one-half inch away from fragments of other pellets. A toothpick marker was then inserted in the soil beside it. Upon melting, the 125° F. pellet leaves a persisting band of soot on the toothpick. Fragments of other pellets can be placed close together, but they should not touch or they may fuse and make it difficult to interpret results.

In addition to their usefulness in large scale sampling of clearcut areas, temperature pellets also proved admirably suited for sampling temperatures of the soil next to the stems of newly germinated seedlings (Fig. 1). When seedlings are under continuous observation, pellet fragments even as fine as a dust can be used effectively but are easily lost. For intermittent observation over long periods, relatively long splinter-like fragments of small diameter are better. These may be placed very close to a tiny stem without actually touching or shading it. Long fragments are especially desirable where loose seedbeds such as duff or moss make it hard to predict at what surface level the highest temperature will occur. The 125° fragment should be used some distance away from seedling stems because of sooting. With these precautions, the maximum surface temperatures near a seedling stem can be accurately measured with practically no disturbance of the natural conditions of the microsite.

Two further precautions should be taken in handling or transporting pellets. To guard against accidental melting, they should be carried in an insulated bag. Pellets frequently melt when left unprotected inside an auto parked in the sunshine. Since the 125° pellets react chemically with the others, they should be packaged separately. The 125° pellets also become oily from prolonged exposure to body heat when carried in the pockets of clothing.

Whether used for extensive sampling to find the percent of seedbeds reaching lethal temperatures or for determining maximum temperatures in the minute area near a seedling stem, temperature pellets show promise as a new and reliable research tool.

# Exposure of Loblolly Pine Planting Stock[1]

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*"The evergreen or coniferous trees have a resinous sap, to say nothing of any other and minor peculiarities in which they differ from the broad-leaved or deciduous trees. If this resinous sap is once allowed to be checked in its flow or hardened by the exposure of the tree-roots to the drying influence of the sun and wind, the circulation of the vital fluid is stopped forever. No application of water, though in floods, will start the flow again . . . we have seen trees brought to be planted, and by those who knew something about trees, brought apparently in good condition, and then laid upon the ground to be exposed to the sun or wind while the holes were being dug for their reception; and this exposure was just long enough for them to be death-struck and the holes to be their graves. . . ."*

—N. H. EGLESTON

EARLY literature on tree planting frequently emphasized the dire effects of direct root exposure on coniferous planting stock, echoing Egleston's[2] admonition expressed so eloquently more than seventy years ago. Later observations have indicated that these early warnings greatly exaggerated the dangers of direct exposure, at least for the several coniferous species that have since been tested under controlled conditions. Lifting, grading, and field planting inevitably entail some direct exposure of roots, but moderate drying is apparently not harmful and need not be interpreted as evidence that the seedlings are "death-struck" and should be culled.

Wakeley[3] found that exposing roots of longleaf and slash pine seedlings up to about 20 minutes did not materially or consistently reduce survival. As exposure time was increased beyond 20 minutes, survival of both species decreased. Exposure of 5⅓ hours reduced survival to 6 percent. Cummings[4] subjected shortleaf pine seedling roots to exposure up to 135 minutes and obtained a smooth curve of survival at the end of the first growing season following treatment. Mortality ranged from about 7 percent for control seedlings down to about 80 percent for seedlings subjected to the 135-minute drying period. Studies at the California Forest and Range Experiment Station[5] indicated that exposure of three-year-old transplants of Jeffrey pine for fifteen minutes or longer severely reduced survival. Transplants not exposed survived approximately 70 percent while those exposed for one hour survived only about 7 percent.

Quite frequently *puddling*, i.e., coating the roots by dipping them in creamy mud, has been advocated as a protective measure against chance exposure during planting operations. Evidence on the value of this measure, however, has not been judged conclusive. Wakeley[6] sums it us as follows: "In practice, puddling still is widely used in farm planting, but seldom in large-scale operations. Since unpuddled seedlings survive satisfactorily, puddling is judged unnecessary, except possibly where moss cannot be obtained to keep the roots moist during planting."

There are apparently no published reports of root exposure tests on loblolly pine nor of tests involving deliberate drying of roots protected by puddling or other similar treatements. Since loblolly pine is one of the most widely planted species, it seems desirable to obtain a measure of its tolerance to root drying by direct exposure and to determine whether puddling or wetting the roots in water would increase the capacity to withstand such exposure. The purpose of this report is to summarize the results of studies on the tolerance of loblolly pine seedlings to withstand direct exposure of roots before planting.

## Materials and Methods

An exploratory test was initiated in the spring of 1952 to obtain information principally on the effect of stock size, duration of exposure, and time of day on survival of loblolly pine, using a total of 2,000 seedlings. The specific sources of variation included two sources of stock,[7] five durations of exposure (0, 5, 10, 20, and 40 minutes), two size classes of seedlings, and either mid-morning or mid-afternoon exposure. At the end of the first growing season, mortality for all treatments and variables combined averaged 12 percent, with a range of 0 to 49 percent. Although significant differences occurred within every source of variation, the high average survival of 88 percent suggested that the drying periods

[1]Contribution from the School of Forestry, North Carolina Agricultural Experiment Station, Raleigh, N. C. Published with the approval of the Director of Research as Paper No. 699 of the Journal Series.

[2]Egleston, Nathaniel H. Handbook of tree-planting. D. Appleton and Company. New York. 126 pp. 1884.

[3]Wakeley, Philip C. Planting the southern pines. Agriculture Monograph No. 18. Forest Service, U. S. Dept. of Agric. pp. 233, illus. 1954.

[4]Cummings, W. H. Exposure of roots of shortleaf pine stock. Jour. Forestry 40: 490-492. 1942.

[5]California Forest & Range Exp. Sta. Annual report. Forest Research in California. pp. 15. 1954.

[6]Op. cit.

[7]Grateful acknowledgement is made to the Clayton Nursery of the N. C. Division of Forestry for making stock available for this test.

TABLE 1.—AVERAGE CHARACTERISTICS OF THE ONE-YEAR-OLD LOBLOLLY PINE PLANTING USED IN THE 1953 TEST

| Size class | Diameter at root collar | Shoot length | Root length | Green weight | Dry weight | Dry wt. Green wt. |
|---|---|---|---|---|---|---|
| | *Cm.* | *Cm.* | *Cm.* | *Gm.* | *Gm.* | *Ratio* |
| Large | 0.32 | 16.76 | 22.10 | 51.4 | 21.2 | 0.412 |
| Small | 0.24 | 14.22 | 19.81 | 25.4 | 10.3 | 0.405 |

used in this test did not encompass a critical range.

Accordingly, a new series of experiments was started in the spring of 1953 to provide longer exposure and also to test the effects of trees subjected to puddling or wetting of the roots before drying. The seedlings used were grown in the nursery of the School of Forestry at Raleigh, North Carolina; they were graded out of "bed-run" stock into two categories, either uniformly large or uniformly small. The two size classes represented trees in the upper and lower limits of the plantable range. Based on measurements of replicated, randomly selected bundles from each size class, seedlings in the large category weighed approximately twice as much as those in the small category (Table 1).

Next, the seedlings were assembled into the required number of bundles, each consisting of 10 seedlings. One-third of these bundles were drawn out and placed in buckets containing enough water to completely cover the roots; another third was immersed to the root collar in puddled clay; the remaining third was carefully heeled into trenches in the usual manner to serve as controls. The immersion in water and puddled clay followed the recommendations in planting leaflets[8] and lasted approximately two hours.

Following this "root-conditioning" treatment, six bundles from each of the three parent lots were drawn and assigned at random to each of the five exposure times of 0, 30, 60, 90, and 120 minutes. To insure good air circulation and uniform drying for the duration of the exposure, the seedling bundles were placed on an elevated plank, with the roots extending beyond the edge. The seedlings were exposed March 27, 1953, from 1:25 to 3:25 P.M. The seedlings were exposed to direct sunlight with temperatures averaging 56°F, relative humidity 41 percent, and wind velocity 12 miles per hour. All exposed bundles, along with controls, were then carefully heeled back into trenches in the regular manner, and were planted in heavy sedimentary soil the following day.

The field lay-out was a series of randomized complete blocks, replicated six times. With two seedling sizes, three "root-conditioning" treatments, and five durations of exposure, there were thirty randomized rows of 10 seedlings each per block, or a total of 1,800 seedlings for the entire test.

Although the summer of 1953 was very dry, no artificial watering was applied; consequently, the seedlings underwent a severe drought test. Survival was checked at one-month intervals from planting to the end of the growing season in late fall. Since the periodic checks did not reveal any marked departures from expected mortality trends, only the final first-season survival data are used in this evaluation.

[8] E.G., Thee Planters' Notes No. 10. Forest Service, U. S. Department of Agriculture, April, 1952.

## Results

*Survival.*—The survival of the clay-puddled stock was superior to either that of the water-soaked or the heel-in (control) (Table 2 and Fig. 1). On an absolute basis, the superiority of clay-puddling over water-soaking was 15 percent, and over heel-in, approximately 40 percent, all differences being highly significant. Water-soaking was also beneficial at all levels of exposure.

Of additional interest is the better survival of clay-puddled stock over the control stock in the series not exposed, the mean difference of approximately 13 percent being clearly significant at the 0.01 level. In this respect, even the water-soaked seedlings were superior to the controls, but here the mean survival difference was significant only at the 0.05 level.

After 30 minutes exposure the heeled-in seedlings showed a consistent and significant downward trend in survival, with about three-fourths of the trees dying in the lots subjected to 2 hours of drying. Behavior of the water-soaked stock was erratic; beyond 90 minutes of drying, there was a sharp drop in survival. Exposure produced no significant differences in the clay-puddled lots. Even with the maxi-

TABLE 2.—AVERAGE PERCENTAGE OF SURVIVAL AT THE END OF THE FIRST GROWING SEASON AFTER PLANTING FOR ONE-YEAR-OLD LOBLOLLY PINE SEEDLINGS SUBJECTED TO DIFFERENT "ROOT-CONDITIONING" TREATMENTS AND ROOT-DRYING PERIODS

| | Large seedlings | | | | Small seedlings | | | | Both sizes | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exposure | Heel-in | Water | Clay | All | Heel-in | Water | Clay | All | Heel-in | Water | Clay | All |
| *Minutes* | *Percent* | | | | *Percent* | | | | *Percent* | | | |
| 0 | 86.6 | 93.3 | 98.3 | 92.7 | 83.3 | 93.3 | 98.3 | 91.6 | 84.9 | 93.3 | 98.3 | 92.2 |
| 30 | 83.3 | 88.3 | 90.0 | 87.2 | 73.3 | 96.7 | 96.7 | 88.9 | 78.3 | 92.5 | 93.3 | 88.0 |
| 60 | 45.0 | 80.0 | 91.6 | 72.2 | 56.6 | 76.6 | 93.3 | 75.5 | 50.8 | 78.3 | 92.4 | 73.8 |
| 90 | 30.0 | 75.0 | 96.7 | 67.2 | 41.6 | 88.3 | 95.0 | 78.3 | 35.8 | 81.6 | 95.8 | 71.2 |
| 120 | 15.0 | 61.6 | 95.0 | 57.2 | 38.3 | 48.3 | 96.7 | 61.1 | 26.6 | 54.9 | 95.8 | 59.1 |
| Mean | 52.0 | 79.6 | 94.3 | 75.3 | 59.0 | 80.6 | 96.0 | 79.1 | 55.3 | 80.1 | 95.1 | 76.9 |

Least significant differences between means at the 0.01 level:
For "root-conditioning"—5.4%
For exposure time—6.9%
For "root-conditioning" X exposure—12.1%

mum exposure period of two hours, survival of the puddled seedlings was significantly greater than that of the unexposed heeled-in stock.

Contrary to expectations, size class of seedlings was not significant in this experiment.

*Growth.* — Incidental observations and measurements were taken on current growth to determine whether duration of root drying appreciably affected shoot development. In the water and clay series, the reduction in growth for the longest exposure was approximately one inch. Without evaluating their variabilities, the current growth data for the large and small stock combined are tabulated by root treatments and exposure times (Table 3).

The data indicate that severe exposure does reduce shoot growth even when survival is not affected; there is also a suggestion that clay puddled stock may grow faster at the start.

Table 3.—Current Shoot Growth of Loblolly Seedlings

| Exposure | Heel-in | Water-soaked | Clay-puddled | All treatments |
|---|---|---|---|---|
| *Minutes* | | *Inches* | | |
| 0 | 4.6 | 4.9 | 5.1 | 4.9 |
| 30 | 3.9 | 3.7 | 4.9 | 4.2 |
| 60 | 3.2 | 4.5 | 4.7 | 4.1 |
| 90 | 2.7 | 3.6 | 4.2 | 3.5 |
| 120 | 2.7 | 3.6 | 4.1 | 3.5 |
| Mean | 3.6 | 4.1 | 4.6 | 4.0 |

## Discussion

This study indicates the capacity of one-year-old loblolly pine planting stock to withstand direct exposure of roots to sun and wind. Safe duration of such exposure appears to be not more than thirty minutes when no special measures for root protection have been taken. Conceivably, this limit might be shorter or longer, depending on differences in weather conditions.

It is recognized that excessive root-drying may occur not only through direct exposure which is usually greatest during planting, especially in machine operations, but also through gradual desiccation where no direct exposure to sun and wind are involved. This desiccation starts in the lifting tubs and continues through grading, packing, storage, and transit, particularly if the stock is inadequately "mossed-down" in baling; it may also occur when and if stock is bundled and carelessly heeled-in. Although the effects of gradual drying were not under test in this study, incidental observations have indicated that in the cool, shaded environs of the grading, packing, and storage sheds, prolonged loss of moisture may not be particularly harmful to loblolly pine.

The significant improvement in survival of loblolly pine with clay-puddled roots is noteworthy, regardless of whether or not subsequent direct exposure occurs. Although the clay or mud coating appears quite dry following even brief exposure, apparently its protective function remains effective in reducing injury from desiccation over at least a 2-hour drying period. This finding suggests the advisability of puddling loblolly planting stock as a simple precautionary measure against excessive, chance exposure. The auxiliary benefits indicated in this study would also seem to warrant puddling, regardless of any need to guard against the dangers of direct exposure of roots.

Some planters may object to puddling because it dirties the roots, or seedlings may stick together if the mud dries hard. Experience in bar-planting of some 60,000 puddled seedlings within the past two years on the Hill Demonstration Forest has proven neither the dirt nor the stickiness of the mud to be objectionable. On the other hand, the clay coating has been found to slightly stiffen the roots, making bar-planting easier and minimizing danger of U-root formation.

It may well be that greatest benefits from puddling would accrue if treatment of stock took place at the end of the grading table, but this practice might involve additional complications. At the present stage of knowledge, puddling at the planting site just before putting stock into trays, or on the machine, would appear to be a simple, feasible practice.

## Summary

Bare-rooted, water-soaked, and clay-puddled one-year-old loblolly pine planting stock were directly exposed to sun and wind. Exposure periods of 0, 30, 60, 90, and 120 minutes were investigated on a typical spring planting day in March, 1953, in Raleigh, North Carolina. A total of 1,800 seedlings, half of which were large (average green weight 51 grams per seedling) and half small (average green weight 25 grams per seedling) were used in the test.

Final survival and growth measurements were made in November 1953, approximately 8 months after planting.

This study showed that:

1. Bare-rooted stock from ordinary heel-in beds or trenches withstood about 30 minutes of direct exposure without significantly lowering survival. Water-soaked seedlings successfully withstood longer exposure, but after 1½ hours of drying, survival dropped sharply. Clay-puddled seedlings withstood drying for at least 2 hours without a significant reduction in survival.

2. After 2 hours of direct exposure, clay-puddled seedlings survived significantly better than bare-rooted control stock that had not been exposed.

3. Measurements of shoot growth indicate that longer exposures reduce current height growth in the first year, and that clay-puddled stock grows faster regardless of treatment.

It is suggested that planters of loblolly pine and similar species give this practice additional testing because clay-puddling provides insurance against dangers from direct exposure during planting operations. Puddling may also yield other auxiliary benefits.

# Statistics from Schools of Forestry for 1955: Degrees Granted and Enrollments

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*This article is another in a series of comparable papers appearing annually in the Journal of Forestry since 1934, reporting the enrollment at the schools of forestry and the numbers of degrees conferred. Statistics of this type were first assembled when the Forest Education Inquiry made its study in 1929-1931, and were published in the Inquiry's report in 1932.[1] The annual articles in the Journal have brought to date the figures for each successive year.[2]*

THE STATISTICS on degrees granted by schools of forestry in the United States were broken down in 1953 by specialized curricula. This was a new method of reporting which had been discussed for several years but had not been put into use. The presentation met with so much success that it was suggested that the same be done for enrollment statistics in 1954. After reviewing the curricula of the different schools it was found that there was little segregation during the first two years and in some institutions the forestry freshmen followed a curriculum common to all students. For this reason the breakdown in enrollment was made only for the junior and senior years.

The same five broad classes used in 1953 and 1954 have been used again for reporting the junior and senior enrollment and the degrees granted. These are *General Forestry, Wood Technology and Utilization, Range Management, Wildlife Management and Forest Recreation*. Those curricula falling outside of these broad classes have been grouped under the heading *Others*. (See Jour. Forestry 53: 256-261.)

[1]Graves, H. S. and C. H. Guise, Forest education. Yale Univ. Press, New Haven. 1932.

[2]Guise, C. H. (Eighteen articles on degrees granted and enrollments at schools of forestry in the United States, 1934-1948). Jour. Forestry 32:337-343; 32: 402-405; 34:114-120; 35:77-83; 36:12-18; 37:197-202; 38: 241-246; 39:359-364; 40:196-202; 41:87-91; 42:357-360; 43:172-175; 44:110-114; 45:174-180; 46:168-173; 47:93-100; 48:165-169; 49: 7-12.

Marckworth, Gordon D. Jour. Forestry 50:262-265; 51:256-259; 52:354-358; 53:256-261.

## Degrees Granted

During the calendar year 1955 the 35 schools of forestry awarded an estimated 829 undergraduate degrees, 199 master degrees, and 33 doctor degrees. Of the undergraduate degrees granted, 763 or 92 percent were awarded by the accredited schools compared to 858[3] or 90 percent in 1954, 903 or 85 percent in 1953, and 1,095 or 86 percent in 1952.

Looking at the breakdown of the undergraduate degrees in the specialized fields, we find that 577 of the 829 degrees granted, or 70 percent, were in the field of *General Forestry*. This compares to 67 percent in 1954, 72 percent in 1953, and 71 percent in 1952 (Table 2). *Wood Technology and Utilization* ranked second with 10 percent and *Wildlife Management* followed with 7½ percent. Nearly 8 percent of the total number of degrees granted in 1955 were classified as *Others*, compared to 9 percent in 1954, 7 percent in 1953, and 5 percent in 1952.

[3]There is a slight difference between the number of degrees granted in 1954 as reported here and those reported last year due to corrected figures supplied by some of the reporting schools.

The number of master degrees conferred in 1955 showed an increase of 11 percent over 1954, increasing from 179 to 199. However, this was 27 less than the 1952 figure of 226. Once again *General Forestry* accounted for the largest number, accounting for 51 percent. *Wildlife Management* ranked second with approximately 16 percent compared to 17 percent in 1954, and 26 percent in 1953. The accredited schools granted 193 of the 199 master degrees conferred in 1955, or 97 percent. Only three non-accredited schools granted master degrees and all of these were in the field of *Wildlife Management* (Table 3).

The number of doctor degrees granted dropped from the 44 to 33. As in 1954, more than half (51 percent) were in the field of *General Forestry*. All doctor degrees were granted by accredited schools except two in *Wildlife Management* awarded by Virginia Polytechnic Institute (Table 4).

## Undergraduate Enrollment

In 1953 the undergraduate enrollment showed an increase for the first time since 1948, increasing from 4,691 in 1952 to 4,909 in 1953. This was an increase of 5 percent. In 1954 the increase was from 4,909 to 5,357 or 9 percent, and in 1955 from 5,357 to 6,038 or 11 percent (Table 5). Numerically the increase this year is one and a half times that in 1954—681 versus 448—and three times that in 1953. The increase this year has been brought about by increases

TABLE 1.—SIGNIFICANT STATISTICS FOR 1951 THROUGH 1955

| | 1951 | 1952 | 1953 | 1954 | 1955 |
|---|---|---|---|---|---|
| Bachelor's degrees conferred | 1,564 | 1,267 | 1,045 | 957 | 829 |
| Master's degrees conferred | 267 | 226 | 151 | 179 | 199 |
| Doctor's degrees conferred | 21 | 25 | 37 | 44 | 33 |
| Undergraduates enrolled | 4,799 | 4,691 | 4,909 | 5,357 | 6,038 |
| Members of freshman class | 1,370 | 1,536 | 1,698 | 1,986 | 2,149 |
| Members of sophomore class | 1,107 | 1,012 | 1,168 | 1,377 | 1,566 |
| Members of junior class | 1,053 | 1,013 | 917 | 1,032 | 1,236 |
| Members of senior class | 1,269 | 1,130 | 1,126 | 962 | 1,087 |
| Graduate students—master's | 344 | 281 | 349 | 423 | 405 |
| Graduate students—doctor's | 137 | 130 | 139 | 127 | 161 |

TABLE 2.—BACHELOR DEGREES GRANTED FOR COMPLETION OF STUDIES IN SPECIALIZED FIELDS AT SCHOOLS OF FORESTRY IN THE UNITED STATES—CALENDAR YEARS 1954 AND 1955

| Accredited schools | General forestry | | Wood technology | | Range management | | Wildlife management | | Forest recreation | | Others | | Totals | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1954 | 1955 | 1954 | 1955 | 1954 | 1955 | 1954 | 1955 | 1954 | 1955 | 1954 | 1955 | 1954 | 1955 |
| Alabama | 10 | 9 | 3 | 1 | — | — | — | — | — | — | — | — | 13 | 10 |
| California | 27 | 25 | — | — | — | — | — | — | — | — | — | — | 27 | 25 |
| Colorado | 13 | 15 | 11 | 6 | 9 | 11 | 7 | 13 | 10 | 4 | — | — | 50 | 49 |
| Florida | 13 | 14 | — | — | — | — | 2 | 1 | — | — | — | — | 15 | 15 |
| Georgia | 36 | 29 | — | — | — | — | — | — | — | — | — | — | 36 | 29 |
| Idaho | 22 | 20 | 3 | 1 | 3 | 3 | 3 | 4 | — | — | 2 | — | 33 | 28 |
| Iowa | 32 | 25 | — | — | — | — | — | — | — | — | — | — | 32 | 25 |
| La. Poly. Inst. | 9 | 9 | — | — | — | — | — | — | — | — | — | — | 9 | 9 |
| Louisiana State | 20 | 12 | — | — | — | — | 1 | — | — | — | — | — | 21 | 12 |
| Maine | 31 | 24 | — | — | — | — | 11 | 6 | — | — | — | — | 42 | 30 |
| Massachusetts | 12 | 14 | — | — | — | — | 9 | 2 | — | — | — | — | 21 | 16 |
| Michigan State | 26 | 32 | 4 | 4 | — | — | 19 | 15 | 5 | 10 | 27 | 36 | 81 | 97 |
| Michigan Univ. | 26 | 21 | 7 | 4 | — | — | 12 | 2 | — | — | 4 | 1 | 49 | 28 |
| Minnesota | 19 | 14 | 8 | 7 | — | — | 1 | — | — | — | — | — | 28 | 21 |
| Missouri | 13 | 19 | — | — | — | — | — | — | — | — | 1 | 2 | 14 | 21 |
| Montana | 19 | 29 | 1 | 2 | 5 | 9 | — | 4 | — | — | — | 1 | 25 | 45 |
| New York | 34 | 43 | 34 | 22 | — | — | — | — | — | — | 46 | 27 | 114 | 92 |
| North Carolina | 23 | 19 | 11 | 13 | — | — | — | — | — | — | 1 | — | 35 | 32 |
| Oregon | 29 | 30 | 8 | 7 | — | — | — | — | — | — | — | — | 37 | 37 |
| Pennsylvania | 55 | 48 | 3 | 2 | — | — | — | — | — | — | — | — | 58 | 50 |
| Purdue | 21 | 24 | 4 | 4 | — | — | — | — | — | — | — | — | 25 | 28 |
| Utah | 12 | 4 | — | — | 14 | 5 | 11 | 6 | — | — | — | — | 37 | 15 |
| Washington Univ. | 36 | 24 | 4 | 3 | — | — | — | — | — | — | — | — | 40 | 27 |
| West Virginia | 14 | 17 | — | 4 | — | — | 2 | 1 | — | — | — | — | 16 | 22 |
| Total | 552 | 520 | 101 | 80 | 31 | 28 | 78 | 54 | 15 | 14 | 81 | 67 | 858 | 763 |
| Schools not accredited | | | | | | | | | | | | | | |
| Arkansas | 14 | 7 | — | — | — | — | — | — | — | — | — | — | 14 | 7 |
| Connecticut | 3 | 8 | — | — | — | — | 1 | 1 | — | — | — | — | 4 | 9 |
| Mich. Mining | 19 | 14 | — | — | — | — | — | — | — | — | — | — | 19 | 14 |
| New Hampshire | 5 | 4 | — | — | — | — | 6 | 3 | — | — | — | — | 11 | 7 |
| Oklahoma | 17 | 11 | — | — | — | — | — | — | — | — | — | — | 17 | 11 |
| Texas (S. F. Austin) | 5 | — | — | — | — | — | — | — | — | — | — | — | 5 | — |
| Univ. of South | 4 | — | — | — | — | — | — | — | — | — | — | — | 4 | — |
| Virg. Poly. Inst. | 12 | 5 | — | — | — | — | — | 1 | — | — | — | — | 12 | 6 |
| Washington State | 8 | 8 | — | — | — | — | 5 | 4 | — | — | — | — | 13 | 12 |
| Total | 87 | 57 | — | — | — | — | 12 | 9 | — | — | — | — | 99 | 66 |
| Grand total | 639 | 577 | 101 | 80 | 31 | 28 | 90 | 63 | 15 | 14 | 81 | 67 | 957 | 829 |

in all classes.

Looking at the breakdown by specialized curricula we find that *General Forestry* accounted for 65 percent of the junior and 67 percent of the senior enrollment (Table 7). These percentages are approximately the same as the percentage of undergraduate degrees granted in *General Forestry* in 1954 and 1955, namely 67 and 70 percent. On the basis of these figures we can expect during the next two years that about two-thirds of the bachelor degrees will be granted in the field of *General Forestry*.

*Wood Technology and Utilization* accounted for 10 percent of the juniors and 10 percent of the seniors, while *Wildlife Management* totalled 11 and 9 percent respectively, and *Range Management* only 3 and 2 percent respectively.

Assuming the same trends now evident, all undergraduate classes should show an increase again next year of at least 10 percent. This would mean a total enrollment of approximately 6,600.

The number of women enrolled in undergraduate classes throughout the nation continues to be insignificant, although it shows a marked increase. This year there were 18 undergraduates, compared to 17 last year, which is the largest number enrolled since 1946. If we add the 5 registered for the master degree and 1 for the doctorate we have the largest total on record. The distribution by classes is shown in Table 8.

## Graduate Enrollment

The graduate enrollment is confined to 23 accredited and 3 non-accredited schools, all of which offered the master degree. The enrollment in the accredited schools accounts for 395 of 405 master candidates and 153 of the 161 doctor candidates. Among the accredited schools 192 of the 395 master candidates are enrolled in *General Forestry* (49 percent); 56 in *Wildlife Management* (14 percent); 51 in *Wood Technology and Utilization* (10 percent); and 18 in *Range Management* (4 per cent) (Table 9). The enrollment for the doctorate shows 49 percent in *General Forestry;* 10 percent in *Wood Technology and Utilization*, and 11 percent in *Wildlife Management*.

Of the 566 graduate students enrolled through-out the nation only 6 are women, five candidates for the master degree and one candidate for the doctorate. Four of the five master candidates were in the general field of conservation and the fifth in *Wildlife Management*. The one seeking the doctor-

ate was in the field of *General Forestry*.

## Summary

The increase in enrollment which began in the 1953-1954 scholastic year has continued this year. The increase this year totals 11 percent. This year all classes show an increase in enrollment. Once again two-thirds of the enrollment in the junior and senior classes is in *General Forestry*.

The master candidates decreased from 423 in 1954 to 403 in 1955, while the candidates for the doctorate increased from 127 to 161. Of the total graduate enrollment 566 or 47 percent are in *General Forestry;* 89 or 16 percent in *Wildlife Management*, and 67 or 12 percent in *Wood Technology and Utilization*.

From 1900 through 1955 there have been 23,363 undergraduate degrees granted in the United States. In addition there have been 4,142 master's degrees and 372 doctor's degrees granted (Table 10).

TABLE 3.—MASTER DEGREES GRANTED FOR COMPLETION OF STUDIES IN SPECIALIZED FIELDS AT SCHOOLS OF FORESTRY IN THE UNITED STATES—CALENDAR YEARS 1954 AND 1955.

| Accredited schools | General forestry | | Wood technology | | Range management | | Wildlife management | | Forest recreation | | Others | | Totals | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1954 | 1955 | 1954 | 1955 | 1954 | 1955 | 1954 | 1955 | 1954 | 1955 | 1954 | 1955 | 1954 | 1955 |
| Alabama | 1 | — | — | 1 | — | — | — | — | — | — | — | — | 1 | 1 |
| California | 4 | 3 | — | — | — | — | — | — | — | — | — | — | 4 | 3 |
| Colorado | 1 | 5 | — | — | 1 | 3 | 5 | 3 | — | — | — | 1 | 7 | 12 |
| Duke | 12 | 16 | 5 | 1 | — | — | — | — | — | — | — | — | 17 | 17 |
| Florida | 1 | — | 2 | — | — | — | — | — | — | — | — | — | 3 | — |
| Georgia | 3 | 2 | — | — | — | — | — | — | — | — | — | — | 3 | 2 |
| Idaho | 4 | 3 | 1 | 1 | 3 | 3 | 4 | — | — | — | 1 | 1 | 13 | 8 |
| Iowa | 2 | 1 | — | — | — | — | — | — | — | — | — | — | 2 | 1 |
| Louisiana State | — | — | — | — | — | — | 3 | 1 | — | — | — | — | 3 | 1 |
| Maine | — | — | — | — | — | — | — | 2 | — | — | — | — | — | 2 |
| Massachusetts | — | — | — | — | — | — | 2 | 2 | — | — | — | — | 2 | 2 |
| Michigan State | 4 | 6 | 2 | 3 | — | — | 4 | 6 | 4 | 2 | — | 4 | 14 | 21 |
| Michigan Univ. | 7 | 5 | 5 | 3 | — | — | 3 | — | — | — | 7 | 7 | 22 | 15 |
| Minnesota | 1 | 1 | — | 1 | — | — | — | — | — | — | — | — | 1 | 2 |
| Missouri | 1 | — | — | — | — | — | — | — | — | — | — | — | 1 | — |
| Montana | 2 | 7 | — | — | — | — | — | — | — | 1 | — | 1 | 2 | 9 |
| New York | 12 | 9 | 4 | 4 | — | — | — | — | — | — | 8 | 7 | 24 | 20 |
| North Carolina | 3 | 5 | 5 | 4 | — | — | — | — | — | — | — | — | 8 | 9 |
| Oregon | 7 | 4 | — | — | — | — | — | — | — | — | — | — | 7 | 4 |
| Pennsylvania | 5 | 3 | — | 1 | — | — | 2 | 1 | — | — | — | — | 7 | 5 |
| Purdue | 1 | 3 | 1 | — | — | — | — | 1 | — | — | — | 1 | 2 | 5 |
| Utah | — | 1 | — | — | — | 4 | 4 | 11 | — | — | — | 1 | 4 | 17 |
| Washington Univ. | 8 | 3 | — | — | — | — | — | — | — | — | — | — | 8 | 3 |
| Yale | 15 | 25 | 5 | 9 | — | — | — | — | — | — | — | — | 20 | 34 |
| Total | 94 | 102 | 30 | 28 | 4 | 10 | 27 | 27 | 4 | 3 | 16 | 23 | 175 | 193 |
| Schools not accredited | | | | | | | | | | | | | | |
| Connecticut | — | — | — | — | — | — | 2 | 3 | — | — | — | — | 2 | 3 |
| Virginia Poly. | — | — | — | — | — | — | 2 | 1 | — | — | — | — | 2 | 1 |
| Washington State | — | — | — | — | — | — | — | 2 | — | — | — | — | — | 2 |
| Total | — | — | — | — | — | — | 4 | 6 | — | — | — | — | 4 | 6 |
| Grand total | 94 | 102 | 30 | 28 | 4 | 10 | 31 | 33 | 4 | 3 | 16 | 23 | 179 | 199 |

TABLE 4.—DOCTOR DEGREES GRANTED FOR COMPLETION OF STUDIES IN SPECIALIZED FIELDS AT SCHOOLS OF FORESTRY IN THE UNITED STATES—CALENDAR YEARS 1954 AND 1955

| Accredited schools | General forestry | | Wood technology | | Range management | | Wildlife management | | Forest recreation | | Others | | Totals | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1954 | 1955 | 1954 | 1955 | 1954 | 1955 | 1954 | 1955 | 1954 | 1955 | 1954 | 1955 | 1954 | 1955 |
| California | 1 | 2 | — | — | — | — | — | — | — | — | 1 | 3 | 2 | 5 |
| Duke | 2 | 2 | — | — | — | — | — | — | — | — | — | — | 2 | 2 |
| Iowa | — | 1 | — | — | — | — | — | — | — | — | — | — | — | 1 |
| Michigan State | 2 | 3 | — | 2 | — | — | — | — | — | — | — | — | 2 | 5 |
| Michigan Univ. | 7 | 2 | 2 | — | — | — | 3 | — | — | — | 5 | 1 | 17 | 3 |
| New York | 6 | 3 | 2 | 4 | — | — | — | — | — | — | 1 | 3 | 9 | 10 |
| Purdue | 1 | 1 | — | — | — | — | — | — | — | — | — | — | 1 | 1 |
| Washington Univ. | 2 | 1 | 1 | — | — | — | — | — | — | — | — | — | 3 | 1 |
| Yale | 4 | 2 | 4 | 1 | — | — | — | — | — | — | — | — | 8 | 3 |
| Total | 25 | 17 | 9 | 7 | — | — | 3 | — | — | — | 7 | 7 | 44 | 31 |
| School not accredited | | | | | | | | | | | | | | |
| Virginia Poly. Inst. | — | — | — | — | — | — | — | 2 | — | — | — | — | — | 2 |
| Grand total | 25 | 17 | 9 | 7 | — | — | 3 | 2 | — | — | 7 | 7 | 44 | 33 |

TABLE 5.—ENROLLMENT BY CLASSES AT SCHOOLS OF FORESTRY IN THE UNITED STATES FOR THE FALL TERM 1955-56

| Accredited schools | Freshman | Sophomore | Junior | Senior | Total undergraduates | Graduates Masters | Graduates Doctors |
|---|---|---|---|---|---|---|---|
| Alabama | 47 | 27 | 29 | 13 | 116 | — | — |
| California | 13 | 28 | 44 | 30 | 115 | 14 | 7 |
| Colorado | 179 | 124 | 78 | 54 | 435 | 24 | — |
| Duke | — | — | — | — | — | 25 | 9 |
| Florida | 45 | 36 | 15 | 10 | 106 | 5 | — |
| Georgia | 53 | 49 | 54 | 40 | 196 | 10 | — |
| Idaho | 95 | 48 | 49 | 28 | 220 | 22 | — |
| Iowa | 72 | 41 | 32 | 23 | 168 | 6 | 4 |
| La. Poly. Inst. | 41 | 26 | 13 | 12 | 92 | — | — |
| Louisiana State | 58 | 16 | 23 | 34 | 131 | 5 | — |
| Maine | 85 | 57 | 34 | 39 | 215 | 3 | — |
| Massachusetts | 33 | 19 | 21 | 31 | 104 | 5 | — |
| Michigan State | 146 | 141 | 132 | 118 | 537 | 62 | 20 |
| Michigan Univ. | 25 | 33 | 39 | 54 | 151 | 43 | 28 |
| Minnesota | 95 | 69 | 40 | 38 | 242 | 8 | 12 |
| Missouri | 37 | 47 | 28 | 14 | 126 | 2 | — |
| Montana | 107 | 88 | 35 | 28 | 258 | 6 | — |
| New York | 151 | 135 | 106 | 105 | 497 | 55 | 40 |
| North Carolina | 101 | 42 | 44 | 37 | 224 | 5 | 3 |
| Oregon | 123 | 98 | 60 | 65 | 346 | 15 | — |
| Pennsylvania | 104 | 72 | 55 | 64 | 295 | 11 | — |
| Purdue | 44 | 29 | 41 | 27 | 141 | 7 | 1 |
| Utah | 99 | 72 | 52 | 33 | 256 | 17 | 8 |
| Washington Univ. | 95 | 62 | 44 | 52 | 253 | 11 | 10 |
| West Virginia | 46 | 42 | 32 | 14 | 134 | — | — |
| Yale | — | — | — | — | — | 34 | 11 |
| Total | 1,894 | 1,401 | 1,100 | 963 | 5,358 | 395 | 153 |
| Schools not accredited | | | | | | | |
| Arkansas | 32 | 25 | 12 | 13 | 82 | — | — |
| Connecticut | 17 | 10 | 7 | 16 | 50 | — | — |
| Mich. Mining | 40 | 27 | 35 | 22 | 124 | — | — |
| New Hampshire | 39 | 20 | 9 | 11 | 79 | 2 | — |
| Oklahoma | 27 | 25 | 36 | 22 | 110 | — | — |
| Texas (S. F. Austin) | 25 | 15 | 2 | 8 | 50 | — | — |
| Univ. of the South | 8 | 5 | 4 | 5 | 22 | — | — |
| Virginia Poly. Inst. | 22 | 13 | 13 | 15 | 63 | 4 | 3 |
| Wash. State Coll. | 45 | 25 | 18 | 12 | 100 | 4 | 5 |
| Total | 255 | 165 | 136 | 124 | 680 | 10 | 8 |
| Grand total | 2,149 | 1,566 | 1,236 | 1,087 | 6,038 | 405 | 161 |

TABLE 6.—UNDERGRADUATE FALL TERM ENROLLMENTS BY CLASSES IN SCHOOLS OF FORESTRY IN THE UNITED STATES FOR THE YEARS 1944-1945 THROUGH 1955-1956

| Academic years | —Freshmen— Enrollment | Change | —Sophomores— Enrollment | Change | —Juniors— Enrollment | Change | —Seniors— Enrollment | Change | —Totals— Enrollment | Change |
|---|---|---|---|---|---|---|---|---|---|---|
| 1944-1945 | 321 | + 122 | 114 | + 20 | 64 | — 37 | 72 | — 37 | 571 | + 68 |
| 1945-1946 | 840 | + 519 | 315 | + 201 | 205 | + 141 | 113 | + 41 | 1,473 | + 902 |
| 1946-1947 | 3,611 | +2,771 | 1,840 | + 1,525 | 914 | + 709 | 645 | + 532 | 7,010 | +5,537 |
| 1947-1948 | 2,061 | —1,550 | 2,878 | + 1,038 | 1,577 | + 663 | 938 | + 293 | 7,454 | + 444 |
| 1948-1949 | 1,851 | — 210 | 2,178 | — 700 | 2,497 | + 920 | 1,686 | + 748 | 8,212 | + 758 |
| 1949-1950 | 1,485 | — 366 | 1,667 | — 511 | 1,816 | — 681 | 2,501 | + 815 | 7,469 | — 743 |
| 1950-1951 | 1,442 | — 43 | 1,379 | — 288 | 1,384 | — 432 | 1,730 | — 771 | 5,935 | —1,534 |
| 1951-1952 | 1,370 | — 72 | 1,107 | — 272 | 1,053 | — 331 | 1,269 | — 461 | 4,799 | —1,136 |
| 1952-1953 | 1,536 | + 166 | 1,012 | — 95 | 1,013 | — 40 | 1,130 | — 139 | 4,691 | — 108 |
| 1953-1954 | 1,698 | + 162 | 1,168 | + 156 | 917 | — 96 | 1,126 | — 4 | 4,909 | + 218 |
| 1954-1955 | 1,986 | + 288 | 1,377 | + 209 | 1,032 | + 115 | 962 | — 164 | 5,357 | + 448 |
| 1955-1956 | 2,149 | + 163 | 1,566 | + 189 | 1,236 | + 204 | 1,087 | + 125 | 6,038 | + 681 |

TABLE 7.—ENROLLMENT OF JUNIOR AND SENIOR STUDENTS IN SPECIALIZED FIELDS AT SCHOOLS OF FORESTRY IN THE UNITED STATES FOR THE FALL TERM 1955-56

| Accredited schools | General forestry | | Wood technology | | Range management | | Wildlife management | | Forest recreation | | Others | | Totals | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jr. | Sr. | Jr. | Sr. | Jr. | Sr. | Jr. | Sr. | Jr. | Sr. | Jr. | Sr. | Jr. | Sr. |
| Alabama | 28 | 11 | 1 | 2 | — | — | — | — | — | — | — | — | 29 | 13 |
| California | 40 | 29 | — | — | 4 | 1 | — | — | — | — | — | — | 44 | 30 |
| Colorado | 18 | 13 | 16 | 10 | 8 | 9 | 14 | 6 | 12 | 8 | 10 | 8 | 78 | 54 |
| Florida | 13 | 10 | — | — | — | — | 2 | — | — | — | — | — | 15 | 10 |
| Georgia | 45 | 36 | — | — | — | — | 9 | 4 | — | — | — | — | 54 | 40 |
| Idaho | 27 | 13 | 6 | 3 | 6 | 4 | 6 | 7 | — | — | 4 | 1 | 49 | 28 |
| Iowa | 14 | 13 | 14 | 10 | 4 | — | — | — | — | — | — | — | 32 | 23 |
| La. Poly. Inst. | 13 | 12 | — | — | — | — | — | — | — | — | — | — | 13 | 12 |
| La. State Univ. | 22 | 25 | — | 1 | — | — | 1 | 8 | — | — | — | — | 23 | 34 |
| Maine | 23 | 28 | — | — | — | — | 11 | 11 | — | — | — | — | 34 | 39 |
| Massachusetts | 16 | 18 | — | — | — | — | 5 | 13 | — | — | — | — | 21 | 31 |
| Michigan State | 31 | 30 | 2 | 9 | — | — | 24 | 11 | 8 | 3 | 67 | 65 | 132 | 118 |
| Michigan Univ. | 23 | 38 | 5 | 5 | — | — | 8 | 3 | — | — | 3 | 8 | 39 | 54 |
| Minnesota | 23 | 21 | 8 | 11 | — | — | 9 | 6 | — | — | — | — | 40 | 38 |
| Missouri | 22 | 12 | — | — | — | — | — | — | — | — | 6 | 2 | 28 | 14 |
| Montana | 25 | 21 | 3 | 1 | 2 | 4 | 5 | 2 | — | — | — | — | 35 | 28 |
| New York | 59 | 49 | 23 | 24 | — | — | — | — | — | — | 24 | 32 | 106 | 105 |
| North Carolina | 24 | 30 | 10 | 6 | — | — | — | — | — | — | 10 | 1 | 44 | 37 |
| Oregon | 50 | 62 | 10 | 3 | — | — | — | — | — | — | — | — | 60 | 65 |
| Pennsylvania | 49 | 54 | 6 | 10 | — | — | — | — | — | — | — | — | 55 | 64 |
| Purdue | 38 | 26 | 3 | 1 | — | — | — | — | — | — | — | — | 41 | 27 |
| Utah | 18 | 16 | — | — | 13 | 6 | 21 | 11 | — | — | — | — | 52 | 33 |
| Washington Univ. | 38 | 40 | 6 | 12 | — | — | — | — | — | — | — | — | 44 | 52 |
| West Virginia | 23 | 10 | 6 | 3 | — | — | 3 | 1 | — | — | — | — | 32 | 14 |
| Total | 682 | 617 | 119 | 111 | 37 | 24 | 118 | 83 | 20 | 11 | 124 | 117 | 1,100 | 963 |
| Schools not accredited | | | | | | | | | | | | | | |
| Arkansas | 12 | 13 | — | — | — | — | — | — | — | — | — | — | 12 | 13 |
| Connecticut | 6 | 13 | — | — | — | — | 1 | 3 | — | — | — | — | 7 | 16 |
| Mich. Mining | 35 | 22 | — | — | — | — | — | — | — | — | — | — | 35 | 22 |
| New Hampshire | 4 | 7 | — | — | — | — | 5 | 4 | — | — | — | — | 9 | 11 |
| Oklahoma | 36 | 22 | — | — | — | — | — | — | — | — | — | — | 36 | 22 |
| Texas (S. F. Austin) | 2 | 8 | — | — | — | — | — | — | — | — | — | — | 2 | 8 |
| Univ. of South | 4 | 5 | — | — | — | — | — | — | — | — | — | — | 4 | 5 |
| Va. Poly. Inst. | 12 | 14 | — | — | — | — | 1 | 1 | — | — | — | — | 13 | 15 |
| Wash. State Coll. | 12 | 6 | — | — | 1 | 2 | 5 | 4 | — | — | — | — | 18 | 12 |
| Total | 123 | 110 | — | — | 1 | 2 | 12 | 12 | — | — | — | — | 136 | 124 |
| Grand total | 805 | 727 | 119 | 111 | 38 | 26 | 130 | 95 | 20 | 11 | 124 | 117 | 1,236 | 1,087 |

TABLE 8—FALL TERM ENROLLMENT OF WOMEN IN SCHOOLS OF FORESTRY IN THE UNITED STATES FOR THE YEARS 1943 THROUGH 1955

| | Freshmen | Sophomore | Junior | Senior | Total under graduates | —Graduates— Masters | Doctors |
|---|---|---|---|---|---|---|---|
| 1943 | 2 | — | 1 | 4 | 7 | — | — |
| 1944 | 5 | 5 | — | 1 | 11 | 1 | — |
| 1945 | 5 | 6 | 5 | — | 16 | 1 | — |
| 1946 | 5 | 5 | 4 | 4 | 18 | — | 1 |
| 1947 | 1 | 1 | 3 | 4 | 9 | — | — |
| 1948 | 1 | 3 | 1 | 4 | 9 | 2 | — |
| 1949 | 1 | 1 | 2 | 2 | 6 | 1 | — |
| 1950 | 2 | — | 1 | 4 | 7 | 1 | 1 |
| 1951 | — | 4 | — | 1 | 5 | — | 1 |
| 1952 | 5 | 2 | 3 | — | 10 | 1 | 1 |
| 1953 | 8 | 5 | — | 3 | 16 | — | — |
| 1954 | 7 | 6 | 3 | 1 | 17 | 2 | — |
| 1955 | 4 | 5 | 6 | 3 | 18 | 5 | 1 |

Table 9.—Enrollment of Graduate Students in Schools of Forestry in the United States for the Fall Term 1955-56

| Accredited schools | General forestry | | Wood technology | | Range management | | Wildlife management | | Forest recreation | | Others | | Totals | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ms. | Dr. | Ms. | Dr. | Ms. | Dr. | Ms. | Dr. | Ms. | Dr. | Ms. | Dr. | Ms. | Dr. |
| California | 10 | 2 | — | — | 4 | 2 | — | — | — | — | — | 3 | 14 | 7 |
| Colorado | 3 | — | — | — | 2 | — | 11 | — | 2 | — | 6 | — | 24 | — |
| Duke | 19 | 9 | 6 | — | — | — | — | — | — | — | — | — | 25 | 9 |
| Florida | 3 | — | 1 | — | — | — | 1 | — | — | — | — | — | 5 | — |
| Georgia | 10 | — | — | — | — | — | — | — | — | — | — | — | 10 | — |
| Idaho | 6 | — | 1 | — | 6 | — | 7 | — | — | — | 2 | — | 22 | — |
| Iowa | 2 | 4 | 4 | — | — | — | — | — | — | — | — | — | 6 | 4 |
| La. State Univ. | 2 | — | — | — | — | — | 3 | — | — | — | — | — | 5 | — |
| Maine | 1 | — | — | — | — | — | 2 | — | — | — | — | — | 3 | — |
| Massachusetts | — | — | — | — | — | — | 5 | — | — | — | — | — | 5 | — |
| Michigan State | 14 | 12 | 1 | 1 | — | — | 15 | 7 | 2 | — | 30 | — | 62 | 20 |
| Michigan Univ. | 14 | 9 | 6 | 1 | — | — | 3 | 3 | — | — | 20 | 15 | 43 | 28 |
| Minnesota | 8 | 11 | — | 1 | — | — | — | — | — | — | — | — | 8 | 12 |
| Missouri | 2 | — | — | — | — | — | — | — | — | — | — | — | 2 | — |
| Montana | 4 | — | — | — | 1 | — | 1 | — | — | — | — | — | 6 | — |
| New York | 30 | 10 | 12 | 7 | — | — | — | — | — | — | 13 | 23 | 55 | 40 |
| North Carolina | 2 | — | 3 | 3 | — | — | — | — | — | — | — | — | 5 | 3 |
| Oregon | 13 | — | 2 | — | — | — | — | — | — | — | — | — | 15 | — |
| Pennsylvania | 6 | — | 4 | — | — | — | 1 | — | — | — | — | — | 11 | — |
| Purdue | 3 | — | 1 | — | — | — | — | 1 | — | — | 3 | — | 7 | 1 |
| Utah | 5 | — | — | — | 5 | 2 | 7 | 6 | — | — | — | — | 17 | 8 |
| Washington Univ. | 8 | 9 | 3 | 1 | — | — | — | — | — | — | — | — | 11 | 10 |
| Yale | 27 | 9 | 7 | 2 | — | — | — | — | — | — | — | — | 34 | 11 |
| Total | 192 | 75 | 51 | 16 | 18 | 4 | 56 | 17 | 4 | | 74 | 41 | 395 | 153 |
| Schools not accredited | | | | | | | | | | | | | | |
| New Hampshire | 2 | — | — | — | — | — | — | — | — | — | — | — | 2 | — |
| Va. Poly. Inst. | — | — | — | — | — | — | 4 | 3 | — | — | — | — | 4 | 3 |
| Wash. State Coll. | — | — | — | — | — | — | 4 | 5 | — | — | — | — | 4 | 5 |
| Total | 2 | — | — | — | — | — | 8 | 8 | — | | | | 10 | 8 |
| Grand total | 194 | 75 | 51 | 16 | 18 | 4 | 64 | 25 | 4 | | 74 | 41 | 405 | 161 |

Table 10.—Number of Degrees Granted for Completion of Studies at Schools of Forestry in the United States for the Calendar Years 1900-1955

| Years | Undergraduate degrees | Master's degrees | Doctor's degrees |
|---|---|---|---|
| 1900 | 1 | — | |
| 1901 | 5 | — | |
| 1902 | 2 | 9 | |
| 1903 | 3 | 14 | |
| 1904 | 9 | 29 | |
| 1905 | 9 | 34 | |
| 1906 | 24 | 24 | |
| 1907 | 19 | 27 | |
| 1908 | 31 | 35 | |
| 1909 | 47 | 44 | |
| 1910 | 61 | 48 | |
| 1911 | 100 | 61 | |
| 1912 | 122 | 54 | |
| 1913 | 136 | 37 | |
| 1914 | 151 | 42 | |
| 1915 | 124 | 35 | |
| 1916 | 151 | 36 | |
| 1917 | 160 | 27 | |
| 1918 | 65 | 10 | |
| 1919 | 53 | 6 | |
| 1920 | 160 | 25 | |
| 1921 | 126 | 26 | |
| 1922 | 141 | 44 | |
| 1923 | 217 | 31 | |
| 1924 | 215 | 43 | |
| 1925 | 280 | 44 | |
| 1926 | 259 | 58 | |
| 1927 | 263 | 50 | |
| 1928 | 302 | 64 | |
| 1929 | 291 | 54 | |
| 1930 | 308 | 69 | |
| 1931 | 394 | 97 | (34)[1] |
| 1932 | 380 | 78 | 7 |
| 1933 | 355 | 65 | 6 |
| 1934 | 337 | 47 | 6 |
| 1935 | 423 | 58 | 8 |
| 1936 | 502 | 67 | 9 |
| 1937 | 803 | 75 | 7 |
| 1938 | 980 | 95 | 5 |
| 1939 | 1,102 | 112 | 8 |
| 1940 | 1,072 | 105 | 9 |
| 1941 | 834 | 117 | 12 |
| 1942 | 654 | 76 | 13 |
| 1943 | 446 | 28 | 6 |
| 1944 | 106 | 12 | 3 |
| 1945 | 51 | 18 | 7 |
| 1946 | 192 | 65 | 8 |
| 1947 | 553 | 223 | 7 |
| 1948 | 918 | 222 | 16 |
| 1949 | 1,443 | 205 | 12 |
| 1950 | 2,321 | 275 | 29 |
| 1951 | 1,564 | 267 | 21 |
| 1952 | 1,267 | 226 | 25 |
| 1953 | 1,045 | 151 | 37 |
| 1954 | 957 | 179 | 44 |
| 1955 | 829 | 199 | 33 |
| Total | 23,363 | 4,142 | 372 |

[1]Total doctor's degrees granted prior to 1932. Break-down by years not available.

# Deterioration of Beetle-Killed Pacific Silver Fir

**Ernest Wright, W. K. Coulter, and J. J. Gruenfeld**

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NEARLY two billion board feet of timber in the mixed-fir forests of western Washington needed salvage in the fall of 1954. About one-third of this was dead Pacific silver fir (*Abies amabilis* (Loud.) Forbes). The remainder was weakened or seriously threatened silver fir and associated species.

The immediate cause of the mortality is an epidemic of bark beetles, *Pseudohylesinus granulatus* (Lec.) and *P. grandis* Sw. in silver fir. The shoestring root rot (*Armillaria mellea* (Fries) Quel.) is closely associated with the bark beetle epidemic. The exact effect of attacks by this fungus is not known, but in some cases it weakens trees so that they are more easily overcome by the beetles (*7*). Patch-killing on the lower bole by the beetles may open the way for infection by the fungus. Both the root rot fungus and the beetles can and do kill trees independently.

The outbreak was discovered in 1947 on a small area in Skagit County, Washington. Aerial surveys through 1954 showed the epidemic increased annually in extent and amount of damage. Total acreage infested during the eight-year period was approximately one million acres, practically all in western Washington.

The intensity of damage is variable. Most of the moderate to heavy damage is on the Mt. Baker area of the Cascade Range where, in some stands, over 90 percent of the merchantable silver fir has been killed. Light damage has occurred extensively in the Snoqualmie and Mt. St. Helens areas of the Cascade Range and on the west side of the Olympic Peninsula.

No effective method of control is known for these insects. Control methods which have been successful with other bark beetles require the treatment of infested trees to destroy the beetles. Trees infested with Pseudohylesinus bark beetles often remain green for years and therefore are difficult to detect for treatment. The costs of locating and treating all infested trees would be excessive.

## Salvage

Salvage of the dead and threatened silver fir is very important to the timber industry of the Pacific Northwest. The region's 39 billion board feet of merchantable silver fir is an important source of raw material for the pulp and paper industry.

Although salvage is not a fully effective method of control for the beetles, it will help reduce damage to the stands. Utilizing infested trees during the fall, winter, and early spring destroys the bark beetle broods before they can mature and emerge (*6*). Logging centers of infestation removes susceptible trees and thereby eliminates favorable breeding material.

By 1953 some of the accessible timber in the Mt. Baker area had been salvaged. However, the acreage and trend of the damage indicated the urgent need for a region-wide salvage program. Since many of the infested and susceptible areas were inaccessible, it became necessary to plan salvage several years in advance of logging. To make these plans, information was needed on: (1) the exact locations of the damaged timber, (2) the volume and value of the timber involved, and (3) the rate and nature of deterioration in the dead trees.

## Committee Takes Action

At the fall meeting of the Northwest Forest Pest Action Committee[1] in 1953, a subcommittee was appointed to evaluate the damage, and to stimulate and coordinate research. Membership of the subcommittee included R. V. Diekhaus, Chairman, Puget Sound Pulp and Timber Company, and representatives from the Industrial Forestry Association, Scott Paper Company, Weyerhaeuser Timber Company, Washington State Division of Forestry, Washington State Land Commission, U. S. National Park Service, and U. S. Forest Service. The subcommittee organized and completed a cooperative survey of the dead and damaged timber. This survey showed that on 544,000 acres infested in western Washington in 1954 there was about seven billion board feet of silver fir. Of this, 528 million board feet was killed from 1950 to 1953, and one and one-third billion board feet was currently dying or classed as poor risk (Table 1). The value of the dead timber was conservatively estimated at five million dollars (*1*).

In 1954 a study to obtain the needed information on deterioration was undertaken by the Silver Fir Beetle Subcommittee in cooperation with the Pacific Northwest Forest and Range Experiment Station of the U. S. Forest Service. The objectives were to determine:

1. The annual rate of deterioration in the beetle-killed trees.
2. The lumber and pulp mill scale deductions for rot.
3. The actual pulp yields from beetle-killed trees.

[1]The Northwest Forest Pest Action Committee was formed in 1948. It is composed of representatives from private, state, and federal timberland managing organizations and has assumed leadership in combating northwest forest pest problems.

Deterioration of windthrown silver fir had been reported upon by Boyce in 1929 (*3*), Buchanan and Englerth in 1940 (*4*), and Childs and Clark in 1953 (*5*). No comprehensive study had been made of deterioration in standing beetle-killed silver fir.

The study of deterioration in 1954 was limited to the changes in the physical properties of the wood caused by wood decay fungi that enter the trees after they are beetle-killed. Studies were not made of decay occurring prior to the death of the trees, nor of other agents of wood destruction such as weathering, wood-staining fungi, wood-boring insects, and logging breakage.

## Study Methods

Deterioration data were obtained from a series of trees that were tagged in the year of death by Forest Service entomologists. A total of 39 trees in three mortality classes were studied—10 trees dead two years, 23 trees dead three years, and 6 trees dead four years. These trees were in two representative areas of heavy infestation in mixed coniferous stands at medium elevation in Skagit County, Washington. The sample trees averaged over 200 years of age and 29 inches d.b.h. All were felled and bucked into standard log lengths. The ends of the logs were exposed at each cut for examination. Identification of the rots involved was based on fungus fruiting bodies, the character of the rot, and on cultural isolations from the decaying wood.

The annual rate of deterioration was determined by pathologists. The extent and intensity of the decay was measured on the entire bole up to a top diameter of eight inches. Data on each merchantable log were recorded separately. These data included diameter inside bark, depth of rot penetration, and percentage of wood destroyed in the areas of penetration. Measurements were plotted on U. S. Forest Service Form 558A and the volume of sound and decayed wood determined by planimeter. Deterioration was computed both on a cubic volume and a board foot volume basis. Volume deductions for rot (herein referred to as technical scale) were taken from the graphic form for each merchantable log.

Commercial lumber and pulp mill scale deductions for rot were made by expert scalers who followed standard scaling procedures employed by the industry. The lumber scale was made by the Puget Sound Log Scaling and Grading Bureau. This was a Scribner Decimal C water scale of 44 randomly representative logs from the 39 trees. The pulp mill scale was an average of the volumes recorded by the head pulp scalers for the Scott Paper Company and Weyerhaeuser Timber Company pulp mills at Everett, Washington. This scale was a Scribner Decimal C net truck scale of 14 randomly representative logs.

Pulp cook tests to determine the volume of recoverable pulp were made by the Pulp Research Center of the Weyerhaeuser Timber Company at Everett, Washington. Nine trees were used for the tests. Three trees had been dead two years, three dead three years, and three dead four years. Nineteen samples, ranging from 20 to 90 pounds, were cut from the small end of each scaled log in the nine trees. The samples were removed from the woods on packboards and shipped to the Research Center. Processing was by the sulfate method.

## Results

Results of the deterioration study made in 1954 provide timber managers with rough guides for predicting losses due to decay. The study is being continued to provide more precise data.

TABLE 1.—RESULTS OF EVALUATION SURVEY TO ASSESS THE INTENSITY OF DAMAGE IN 1954

| Class of damage | Total acres | Total net silver fir volume | Net silver fir vol/Acre | Intensity of damage[1] | | | |
|---|---|---|---|---|---|---|---|
| | | | | Uninfested[2] | Infested[3] | Dead[4] | Total |
| | | *Million bd. ft.* | *Bd. ft.* | *Percent of volume* | | | |
| Light | 287,053 | 3,195 | 11,131 | 96.5 | 2.0 | 1.5 | 100.0 |
| Moderate to very heavy | 256,790 | 3,754 | 14,072 | 72.7 | 14.5 | 12.8 | 100.0 |
| Total | 543,843 | 6,949 | 12,778 | 83.7 | 8.7 | 7.6 | 100.0 |

[1]Percentage of total net silver fir volume damaged by silver fir beetles and shoestring root rot on area infested in 1954.
[2]Approximately 724 million board feet of this uninfested volume was in need of salvage due to poor risk from other causes.
[3]The total infested volume was 608 million board feet.
[4]The total dead volume was 528 million board feet.

*Fungi causing decay.*—The principal fungi found were: *Fomes pinicola* (Fries) Cooke, which causes brown-cubical rot; *Stereum chailletii* (Pers.) Fries, which causes patchy rot; and *Polyporus abietinus* Fries, which causes white rot. The shoestring root rot, *Armillaria mellea* (Fries) Quel., was present to some degree at the base of all beetle-killed silver firs, but caused comparatively little rot.

Brown-cubical rots cause the greatest reduction in pulp yield because principally the cellulose is attacked. The patchy rots cause relatively less reduction since both lignin and cellulose are attacked. The white rots cause least reduction because mainly the lignin is attacked. The rot caused by *Armillaria mellia* is intermediate between the brown-cubical and the patchy rots (*2*).

*Rate of deterioration.*—The study showed that forest managers can expect silver fir to deteriorate at the rate of five percent or more of the total volume annually up to four years after trees are beetle-killed (Table 2). This is an esti-

TABLE 2.—RATE OF DECAY IN BEETLE-KILLED SILVER FIR[1]

| No. of yrs. dead | No. of trees | Gross volume[2] | Decay volume |
|---|---|---|---|
| | | *Cu. ft.* | *Percent* |
| 2 | 10 | 3195.3 | 8.5 |
| 3 | 23 | 5545.6 | 15.5 |
| 4 | 6 | 1392.8 | 19.1 |

[1]Based on cubic foot volume of decay determined by forest pathologists.
[2]Gross volumes computed for the entire length of the merchantable bole up to an 8-inch top diameter.

mate of the minimum cubic foot volume of wood lost to use in all logs of dead trees. When dead trees are utilized for lumber the loss will be greater than five percent. Observations indicate that a greater annual loss can be expected in some stands. For example, stands younger than those studied will probably deteriorate more rapidly due to the higher percentages of sapwood in smaller trees.

*Log scale deductions.*—The bureau lumber scale gave rot deductions of 30, 39, and 54 percent for logs from trees dead two, three, and four years. This sample scale of 44 logs gives an approximation of the percentage deductions for cull due to rot that would be applied to logs bought or sold in the Puget Sound area. The bureau scale is the scale most commonly used by industry.

The technical scale on these same 44 logs (computed from the graphic forms) showed approximately 15 percent less board foot deductions for each class of dead trees. The data for these two scales are summarized in Table 3.

Comparable pulp mill scales of 14 logs gave estimated volume reductions for rot of 0, 11, and 28 percent. These mill scales are estimates of recoverable pulp and are used by pulp companies in accounting for mill production. They are made by company scalers employed in the mills. The rots found in this study are commonly known in the industry as sap rot even though the decay often penetrates into the heartwood.

Technical and bureau scales were computed separately for these same 14 logs. From Table 4, in which the percentage reductions for each scale are tabulated, it can be seen that the pulp mill recovery scales gave the smallest percentage reduction in volume. A large part of this difference is due to the method of deducting for rot since less deduction is made in logs intended for pulp than in sawlogs.

*Pulp recovery.*—Pulp cook tests were made to determine the actual amount of useable wood material which could be recovered from beetle-killed trees. The tests showed decreased yields of screened pulp from trees dead more than two years. Furthermore, the quality of the resultant pulp, especially its strength, was reduced. Data on the quantity and quality of the recoverable pulp are not available at the present time. These data, which will be reported in a later publication, will correlate actual pulp yields with the deterioration data obtained by scaling.

## Further Studies

Follow-up studies have been outlined and work already begun. These studies are designed to investigate:

1. Deterioration in trees dead one year and trees dead more than four years.
2. Pulp yields by sulfite processing methods.
3. Variations in deterioration due to stand conditions.
4. Losses due to increased breakage when salvaging beetle-killed trees.

## Summary

In western Washington nearly two billion board feet of timber is in need of salvage. The principal cause of this damage is an outbreak of bark beetles, associated with a root rot fungus, in Pacific silver fir. Since 1947, when the outbreak was discovered, about one million acres of timberland have been affected. This timber is vital to the important pulp and paper industries of the Northwest.

An aggressive salvage program to utilize this timber before it is lost through deterioration was sponsored by the Northwest Forest Pest Action Committee. In 1954 this committee, in cooperation with the Pacific Northwest Forest and Range Experiment Station of the U. S. Forest Service, began a long-term study of the deterioration of the timber in damaged stands. The purpose of the cooperative study is to provide timberland managers with information on deterioration which will serve as a guide in planning salvage programs.

The studies in 1954 were mainly exploratory. Only one agent of deterioration was studied — rot caused by fungi that enter the trees after they are beetle-killed.

The annual rate of deterioration, based on a technical scale by pathologists, was five percent or more of the total cubic foot volume up to four years after tree death. The log scale deductions for cull due to rot in trees dead two, three, and four years were obtained by three methods: A commercial lumber scale by a scaling bureau scaler, a technical scale from graphic forms by pathologists, and private mill scales by the head scalers of two large pulp mills. The bureau lumber scale, which is the basis on which the majority of logs are bought and sold in the Puget Sound area, gave the highest deductions for cull due to rot. The pulp mill recovery scales, which are used in many pulp mills, gave the lowest deductions. The technical scale was intermediate.

Pulp cook tests showed definite decreases in the quantity and quality of screened pulp from trees dead more than two years. Data from these tests will be summar-

TABLE 3.—COMPARISON OF BOARD-FOOT ROT DEDUCTIONS FOR TECHNICAL SCALE BY PATHOLOGISTS AND COMMERCIAL LUMBER SCALE BY SCALING BUREAU SCALER

| No. of yrs. dead | No. of logs | Gross volume | Decay volume | |
|---|---|---|---|---|
| | | | Technical scale | Bureau scale |
| | | *Bd. ft.* | *Percent* | |
| 2 | 8 | 6,140 | 12 | 30 |
| 3 | 31 | 17,980 | 22 | 39 |
| 4 | 5 | 2,600 | 41 | 54 |

TABLE 4.—COMPARISON OF BOARD-FOOT ROT DEDUCTIONS FOR TECHNICAL SCALE AND COMMERCIAL LUMBER AND PULP SCALES

| No. of yrs. dead | No. of logs | Gross volume | Decay volume | | |
|---|---|---|---|---|---|
| | | | Technical scale | Bureau lbr. scale | Pulpmill pulp scale |
| | | *Bd. ft.* | *Percent* | | |
| 2 | 4 | 1,520 | 6 | 24 | 0 |
| 3 | 6 | 2,090 | 11 | 31 | 11 |
| 4 | 4 | 2,400 | 41 | 55 | 28 |

ized in a later report to show the correlation between scaling practices in common use and actual pulp yields.

### Literature Cited


1. Anonymous. 1954. Thirty-third annual Washington State forestry conference, Nov. 5, Seattle, Wash.
2. Bjorkman, Erick, Olof Samuelson, Erick Ringstrom, Tryggve Bergek, and Erik Malm. 1949. Om rotskador i granskog och deras betydelse vid framstallning av kemisk pappersmassa och silkemassa (Decay injuries in spruce forests and their importance for the production of chemical paper pulp and rayon pulp). English summary. Kungl. Skogshogskolans Skrifter (Bulletin of the Royal School of Forestry) 4:71-73.
3. Boyce, J. S. 1929. Deterioration of windthrown timber on the Olympic Peninsula, Washington. U. S. Dept. Agric. Tech. Bul. 104.
4. Buchanan, T. S. and G. H. Englerth. 1940. Decay and other volume losses in windthrown timber on the Olympic Peninsula, Washington. U. S. Dept. Agric. Tech. Bul. 733.
5. Childs, T. W. and J. W. Clarke. 1953. Decay of windthrown timber in western Washington and northwestern Oregon. U. S. Dept. Agric. Forest Pathology Special Release No. 40.
6. Coulter, W. K. 1954. Silver fir beetles. Northwest forest pest leaflet No. 1. Industrial Forestry Association. Portland, Oregon.
7. ——— and John Hunt. 1953. Progress report on *Pseudohylesinus* bark beetles in silver fir in the State of Washington. U. S. Dept. Agric. Forest Insect Laboratory. Portland, Oregon. Unpublished office report.


# Applying The Oxford System in America

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The increasing amount and complexity of scientific literature pertaining to forestry concern us in two ways. First, there is the difficulty of keeping up with the flood of current publications; then, there is the ever-present problem for the research forester to make a thorough review of past literature before exploring a subject of present moment. Lacking the encyclopedic memory and limitless time to cope with such problems on an individual basis, most of us learn to rely upon libraries and files which have a system of bibliographic control for classifying the literature (*i.e.*, grouping together, usually to bring out systematic relationships) and indexing it (*i.e.*, pinpointing, to bring out individual contents and differences).

There are several systems of bibliographic control indigenous to America, and of long standing and use (*3*). From time to time, new systems are created, and it is the purpose of this article to discuss the possibilities of a new system.

*The Oxford System of Decimal Classification for Forestry* (*2*), known in its developmental stages to American foresters since about 1949, was finally published in 1954. It has the official endorsement of member nations of the Food and Agriculture Organization of the United Nations and the International Union of Forest Research Organizations. It has received favorable notice and review in professional journals. It is now being applied successfully abroad. It is available to us on purchase from the Commonwealth Agricultural Bureaux, Farnham Royal, England, for the modest sum of about $1.25 (10 shillings).

Despite these reassuring attributes, the Oxford System is not being adopted readily in the United States. Reasons for this perhaps are threefold:

1. Established forestry libraries are reluctant to exchange their traditional systems for untried ones.

2. There are few new forestry collections in the United States to create a demand for a new system.

3. Librarians and foresters looking over the System for the first time take undue alarm at its size, detail, and comprehensiveness.

It is hoped that the following explanations of and proposals for applying the Oxford System will lead to a more confident approach to its consideration on this side of the Atlantic.

### Kinds of Forestry Collections

To what kind of forestry collection, in the physical sense, can the Oxford System be applied?

1. *Books, pamphlets, and periodical articles.* An example of the documentation of such material as one body of literature is shown in *Forestry Abstracts.*

2. *Photographs.* The British Forestry Commission Census of Woodlands classifies its extensive collection of photographs by the Oxford System.

3. *Maps.* Any map falling within the subject scope of the Oxford System can be classified and indexed. The system also provides a "form tag" number for maps.

4. *Office files.* The Oxford System can be applied to office files covering the entire field of forestry, or to those files covering a very limited portion of it. This matter is discussed in more detail later.

To what kinds of forestry collections, in the subject sense, can the Oxford System be applied?

### General Forestry Library

The obvious use of the Oxford System is in a general forestry library which covers the entire subject field. Its advantages for such a library are that it is up to date, it is expandable by its decimal nature, and it covers in detail the classic scope of forestry. An example of a fairly large general forestry library so classified and indexed is the research library of the British Forestry Commission at Alice Holt, Surrey.

Contrary to what most of us

would assume, the Imperial Forestry Institute Library in Oxford continues to shelf-classify its collection by the Flury System. However, its catalog room does contain a full Oxford System index catalog dating from about 1950, with reported increase in analytical access to literature received since this time. In other words, a good Oxford System index catalog can be used in conjunction with a collection classified by another system, so long as proper cataloging measures insure a cross-over to shelf location.

### Libraries and Files Using Only A Part of the Oxford System

Now it is appropriate to mention the Oxford System's adaptation to forestry collections of limited-subject scope. In this connection it is important to remember that only those portions of the system applying to the collection at hand need be applied.

During initial classifying and indexing, a large portion of the system's categories can be ignored. These unused, or ignored, categories simply stand ready for use when the limited-subject collection expands, as limited-subject collections have a way of doing. They also represent future coordination with other files using the Oxford System.

*A silviculture collection.* — As an example of initial application of the Oxford System to a limited-subject library, let us consider an experiment station concentrating on silvicultural studies. The professional forester (and it is important that initial work be done by persons with professional background) in charge of the station's literature collection goes through the Oxford System, pencil in hand, marking appropriate categories for the collection as he knows it. In all probability his marking will cover the nine classes[1] in the system about as follows:

*Fairly full marking.* Class 1, Factors of the Environment. Biology; Class 2, Silviculture; Class 4, Injuries and Protection.

*Moderate marking* (Fringe areas affecting silviculture). Class 3, Harvest. Logging; Class 4, Forest Management; Class 5, Mensuration.

*Sparse marking* (To 2 or 3 digits only). Class 3, Work Science. Transportation. Forest Engineering; Class 7, Marketing and Transport; Class 8, Forest Products and Their Utilization; Class 9, Forests and Forestry from the National Point of View.

From this outline it can be estimated that, out of the approximate total of 2,500 analytical headings in the 63-page Oxford System, the silvicultural specialist has designated between 1,200 and 1,500 categories for possible application in indexing. Considerably fewer categories, of course, are needed for shelf or file-position classification.

### Utilization Libraries

The Oxford System offers attractive possibilities for newly established industrial collections. Forest industry in America has been slower than industries based on engineering, chemistry, and medicine to develop technical libraries. However, some such libraries do exist, and more are on the way. The Oxford System comes at an auspicious time for them.

A hypothetical application of the system to the library of a logging and manufacturing company might run along these lines:

*Fairly full use.* Classes 3-8, covering logging, engineering, protection, management, marketing, and products manufacture.

*Moderate use.* Class 9, forests and forestry from the national point of view.

*Sparse use.* (Marking to 2 or 3 digits only). Classes 1-2, covering natural sciences and silviculture.

Marking headings for the industrial collection, of course, depends a great deal upon the scope of the company's operations and the interests of the company's foresters. The actual size of a logging and manufacturing library could be kept down through extensive use of interlibrary loan. For example, a company library in Oregon can establish interlibrary loan relations with the forestry library at Oregon State College. Keeping only the most basic and applicable literature in its own files, this library can, through maintaining full Oxford System indexes, provide the company staff with resources borrowed from the larger library.

*Pulp and paper company library.* —An even more specialized form of technical library in the field of forest utilization is that of the pulp and paper company, particularly one operating outside the sheltering wings of the Pulp and Paper Research Institute Library in Appleton, Wisconsin.

Decimal Class 86, and its expansion, in the Oxford System, seems well set up to accommodate such a library. The Class provides for appropriate cross-referencing within the System to categories for pulpwood species, pulpwood supplies, storage, transport, and waste utilization. Class 86 by itself concentrates on pulp and paper processes and products.

### Material Inadequately Covered By the Oxford System

Collections limited to the conventional scope of forestry are adequately covered by the Oxford System. However, both the general forestry library and the limited-subject library will have on hand certain dictionaries, encyclopedias, textbooks in engineering, mathematics, and chemistry, and even histories and biographies, which lie outside the framework of a forestry classification scheme. What is to be done with these?

The answer is appendage to a scheme of classification for knowledge in general. On page 3 of the prefatory section of the Oxford System, there is a hint that the system can be appended to the Universal Decimal Classification (UDC). This classification has some general acceptance in Europe. Americans may prefer to ap-

[1] The decimal structure of the Oxford System is outlined in a review appearing in the JOURNAL OF FORESTRY for Nov. 1954, pp. 868-869.

pend our own familiar Dewey Decimal Classification, an ancestor of UDC and correspondingly similar to it. Dewey has the added advantages of being recently revised, wholly in English, and simple in its treatment of most aspects of modern technology.

The applier of the Oxford System also makes use of its own appended auxilliary subject numbers for general knowledge. These appear on pages 65-76 of the system, and accommodate certain general aspects of form, geographic location, and taxonomy, when properly applied.

The question of a general classification scheme to which the Oxford System can be attached is an innocuous one, presenting few problems, when compared with the question of categories *within* the scope of the system, which appear inadequate for detailed subject analysis of specialized fields in American forestry. Pages 9-10 of the introduction to the system deal with this question. Here it is explained that the framers of the Oxford System realized that, in certain categories, no one method of decimal subdivision could gain international acceptance. Examples of these categories are 242, Thinnings, and 325, Sorting of Wood in the Rough. Such unsubdivided categories are left free for domestic, or unofficial, subdivision.

The problem of domestic subdivision of certain other categories has already come up in discussion about adopting the Oxford System in America. Several inquiries have been made, not about the mechanics of decimal subdivision, which are simple enough, but about sources of new systematic subject subdivisions. A few such sources may be indicated in the form of these hypothetical cases[2]:

*Forest genetics.*—Forester *A* is supervising the establishment of a tree genetics laboratory. The Oxford System as a whole fits the needs of his literature collection, but he foresees the need for intensive subdivisions in the category 165, Phylogeny, Evolution, Heredity, Genetics, Breeding, and Variation. He accepts the 23 headings in this category for a broad outline, but for its unofficial expansion he adopts subdivisions used in early issues of *Plant Breeding Abstracts* (*4*), a scheme originally derived from UDC.

*Range management.*—Forester *B* operates a branch research station which concentrates on range management problems. He wants to use the Oxford System because his overall research organization uses it, and the idea of coordination of research information appeals to him. However, he feels that the category 268, Grazing on Forest and Open Range, is insufficiently subdivided for his research needs. He therefore develops further domestic subdivision of 268 categories along the lines of a subject outline used in the *Selected Bibliography on Management of Western Ranges* (*5*); or he may prefer the range-literature classifications used at the Southern Forest Experiment Station, or at the former Northern Rocky Mountain Forest and Range Experiment Station. In any case, he has models to use in establishing a systematic domestic subdivision for the subject of range management.

*Hydrology.*—Forester *C*, in charge of literature files for a watershed research station, says that the 116 (Hydrology) category of the Oxford System is insufficiently subdivided for his staff's needs. He knows of no ready-made classification scheme for hydrology which can be adapted to the Oxford System, but he does have on hand a copy of the *Hydrology Handbook* (*1*). He uses its contents outline to subdivide the basic headings in the 116 section of the Oxford System.

All three workers interleave their copies of the Oxford System with their unofficial subdivisions, for future application and alteration. Their search for these domestic subdivisions has not been unnecessarily wide, nor has the task of adapting them been more arduous than most tasks to which these men are accustomed. Further, by this close working with the Oxford System, many mysteries of its use have been cleared up.

### Commonwealth Forestry Bureau

The Commonwealth Forestry Bureau in Oxford, chief creator and sponsor of the Oxford System, offers two services which considerably clarify its application. The first of these is the publication *Forestry Abstracts*, a quarterly periodical presenting abstracted citations of selected world literature. Since 1951 the citations have been classified by Oxford System categories, although they do not convey the entire subject-number code needed for cross-referencing. The periodical is available in several forms: conventional, covering the entire field of forestry, and printed on both sides of the page; the same on blank-backed pages, convenient for clipping and mounting; abstracts of utilization literature only; abstracts of non-utilization literature only. The annual subscription rate is about $8.

*Forestry Abstracts'* publication time-lag for American material is rather formidable, and the coverage is spotty. However, it represents for us an excellent source of abstracts of foreign forestry literature.

Persons interested in fuller title coverage of world literature than can be given in selected citations may want to subscribe to the Bureau's *Centralized Title Service* (CTS), an unselected listing of titles indexed by the Bureau's abstractors during their culling of the literature for *Forestry Abstracts*. These references are mailed out in sheets of flimsy or stiff cards, ready for separating and filing. CTS entries are similar to *Forestry Abstracts* entries except for two points: they carry full Oxford System subject-number notation for cross-referencing, but they do not always, due to space limitations and other considerations, give abstracts.

The Bureau prefers to assign

[2]The author gratefully acknowledges suggestions made by H. A. Fowells, A. E. Helmers, and P. C. Wakeley, of the Forest Service, U. S. Department of Agriculture.

charges for CTS after learning requirements of individual subscribers. However, an estimate for air mail-flimsy card service to the United States runs to about $70 a year. The frequency of mailing is every few weeks.

Would-be subscribers to CTS should consider (1) whether CTS substantially replaces our domestic world-literature title service (*Bibliography of Agriculture*), and (2) whether staff time is available to keep filing up to date. Subscribers are quite free to make use of, or not to make use of, the Oxford System features of CTS.

An outstanding feature of these Commonwealth Forestry Bureau services is the high quality of the staff doing the work. Few are trained foresters, but most are language specialists, and they are directed by an energetic ex-India Service forester, F. C. Ford Robertson, whose vigilance and enthusiasm insure the high professional quality of CFB publications. As might be expected, Ford Robertson is a zealous promoter of the Oxford System.

## Summary

The Oxford System of decimal classification for forestry should prove a useful tool for classifying and indexing collections of forestry material in America. The kinds of collections for which it is suited are listed, and some suggestions are made about its adaptation to specialized forestry collections. Material outside the scope of the system may be dealt with by appending other classification schemes, or by using domestic subdivisions which do not violate the structure of the Oxford System. *Forestry Abstracts* and *Centralized Title Service*, two services which employ the Oxford System, are briefly described.

## Literature Cited

1. AMERICAN SOCIETY OF CIVIL ENGINEERS. Committee on Hydrology. 1949. Hydrology handbook. 184 pp.
2. COMMONWEALTH FORESTRY BUR. 1954. The Oxford system of decimal classification for forestry. 115 pp. Commonwealth Agric. Bur., Farnham Royal, Eng.
3. FLICK, F. J. 1954. Classification schemes for forestry. Jour. Forestry 52: 201-202.
4. IMPERIAL BUR. OF PLANT GENETICS. 1932. Index to v. 1 and 2, Plant Breeding Abstracts. 16 pp.
5. RENNER, F. G., et al. 1938. A selected bibliography on management of western ranges, livestock, and wildlife. U. S. Dept. Agric. Misc. Pub. No. 281. 466 pp.

## SCHOOL BOX SCORE 1956 MEMBERSHIP

| School | Student applications received: May 1956 | Total 1955 | Total 1956 |
|---|---|---|---|
| Alabama Polytechnic Institute | 0 | 18 | 6 |
| University of California | 5 | 17 | 33 |
| Colorado A & M College | 0 | 9 | 19 |
| Duke University | 1 | 3 | 4 |
| University of Florida | 0 | 17 | 3 |
| University of Georgia | 0 | 28 | 2 |
| University of Idaho | 0 | 4 | 14 |
| Iowa State College | 2 | 22 | 10 |
| Louisiana Polytechnic Institute | 0 | 13 | 12 |
| Louisiana State University | 3 | 43 | 12 |
| University of Maine | 0 | 12 | 11 |
| University of Massachusetts | 0 | 11 | 10 |
| Michigan State University | 0 | 14 | 25 |
| University of Michigan | 1 | 21 | 15 |
| University of Minnesota | 1 | 19 | 24 |
| University of Missouri | 0 | 26 | 1 |
| Montana State University | 0 | 25 | 17 |
| State University of New York | 2 | 23 | 34 |
| North Carolina State College | 0 | 22 | 2 |
| Oregon State College | 2 | 38 | 21 |
| Pennsylvania State University | 7 | 32 | 13 |
| Purdue University | 0 | 24 | 15 |
| Utah State Agricultural College | 0 | 12 | 7 |
| University of Washington | 0 | 28 | 13 |
| West Virginia University | 0 | 26 | 1 |
| Yale University | 1 | 16 | 10 |
| Totals | 25 | 523 | 334 |

## SECTION BOX SCORE 1956 MEMBERSHIP

| Section | Applications received[1]: May 1956 | Total 1955 | Total 1956 |
|---|---|---|---|
| Allegheny | 10 | 63 | 24 |
| Appalachian | 4 | 38 | 16 |
| Central Rocky Mountain | 0 | 12 | 19 |
| Central States | 1 | 44 | 17 |
| Columbia River | 6 | 100 | 41 |
| Gulf States | 4 | 107 | 36 |
| Inland Empire | 1 | 10 | 19 |
| Intermountain | 0 | 18 | 10 |
| Kentucky-Tennessee | 2 | 9 | 6 |
| New England | 2 | 50 | 41 |
| New York | 3 | 33 | 36 |
| Northern California | 7 | 33 | 42 |
| Northern Rocky Mountain | 0 | 44 | 24 |
| Ozark | 0 | 47 | 8 |
| Puget Sound | 5 | 65 | 31 |
| Southeastern | 4 | 85 | 28 |
| Southern California | 0 | 3 | 1 |
| Southwestern | 0 | 12 | 0 |
| Upper-Mississippi Valley | 4 | 51 | 38 |
| Washington | 1 | 2 | 1 |
| Wisconsin-Michigan | 3 | 40 | 54 |
| Totals | 57 | 866 | 492 |

[1]Students, Junior, Affiliate, Associate (Initial) grades only.

# The Frill: A New Technique in Chemical Debarking

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*A broad girdle around a tree is not necessary for a chemical debarking treatment. A simple frill of ax cuts is equally effective.*

THE commonly used chemical method of debarking pulpwood, or chemi-peeling as it is also called, is well known. Briefly, a strip of bark several inches wide is removed from around the tree, and then the bare wood is painted with sodium arsenite solution. This kills the tree and makes the bark come loose.

In testing ways to destroy worthless trees at the Adirondack Research Center, it was found that a simple frill worked just as well as a complete girdle. Frilled trees that were treated with sodium arsenite debarked about as well as trees treated at the same time with a regular girdle.

## Experiments With Frills

Experiments with frills and sodium arsenite solutions began on the Paul Smith Experimental Forest during the summer of 1951. The next spring, it was found that this method not only killed the soft maple and beech, but also loosened the bark so it could be peeled easily.

After the success of the exploratory studies in 1951, the treatments were repeated during the summers of 1952, 1953, and 1954. Many more trees were used. Poor-quality soft maple, hard maple, beech, yellow birch, white birch, hemlock, aspen, and black cherry were treated. The primary objective was to release young red spruce and balsam fir to improve timber stands on the experimental forest. The secondary objective was to test the frill for bark peeling. More than 14,000 trees were treated on 232 acres. The trees ranged in size from 2 to 28 inches in diameter. They averaged 9 inches.

The frills (Fig. 1) were easy to make. They were cut with a light ax, by simply making a single line of cuts encircling the tree. The chips were left attached at the bottom as shown. Then the exposed bark and wood was painted with a commercial debarking solution containing 40 percent sodium arsenite (Fig. 2).

FIG. 1.—A frill is made with a single line of ax cuts around the tree. The chips are left attached.

FIG. 2.—A paint brush was used to apply the sodium arsenite. Goggles and rubber gloves were worn as safety measures.

It soon became apparent that the treatment was effective. Many of the leaves died within 10 days. The yellow birch seemed to be tougher than hard and soft maples, beech, and hemlock. A few branches remained alive on some of the birch (less than 20 percent), some for even a year or longer. But the crowns were completely killed on more than 80 percent of the birch soon after treatment. The live birch limbs could generally be traced to areas where the ax cuts did not completely penetrate the bark. Apparently not enough chemical had been applied on some trees. There were even fewer live limbs on the maples and beech, and none were found on the frilled hemlocks several months after treatment.

## Effect of The Treatment

After each treatment, the frills and sodium arsenite solution caused bark to peel within less than 1 year. Within 1½ years after treatment, nearly all of the bark had fallen off many of the maples and beeches.

The bark of white birch and yellow birch did not shed like that of maple and beech. Although the birch bark was dead and loose next to the sapwood, the tough outside bark held together. It was necessary to split the bark with a spud before it could be peeled. Pulpwood operators later con-

FIG. 3.—This smaller kind of frill is now being tested experimentally. It is easier to make. Use of the syringe for applying the chemical promises to be an improvement over use of the brush.

[1]Stationed at the Adirondack Research Center, Paul Smiths, N. Y., which is maintained by the Northeastern Forest Experiment Station in cooperation with Paul Smith's College.

firmed the fact that the bark on both birches reacts the same way when given the regular debarking treatment.

Bark on hemlocks was well preserved and had not broken apart within a year after treatment. However, once it had been split with a spud, it could be easily pulled off in sheets 8 to 10 feet long.

Some of the bark below the frills remained alive for more than a year after treatment. Later it began to die. This was especially true of the hardwood trees. Hemlock bark below the frills seemed to kill more easily. We have observed that new sprouts originating from these areas of live bark begin to die about 2 years after the treatment—an indication that the bark and underlying sapwood continue to die downward from the frill.

### Costs—And A Caution

A few details about the cost of frilling the 14,000 trees may be of interest. Inasmuch as the experimental treatments were designed for improving timber stands rather than for producing pulpwood on a commercial scale, caution should be used in attempting to apply these costs directly to the production of pulpwood. Then too, labor costs were high and a rather complicated system for selecting trees was used. Here are a few details about a 48-acre stand where frills and sodium arsenite solution were used in July 1953 to release red spruce and balsam fir:

1. Most of the trees frilled were soft maple; they averaged 10.4 inches in diameter and 42 trees were treated per acre.

2. The cost per acre was $5.63. This includes $0.34 for the chemical and $5.29 for labor at $1.40 per hour. Travel time to and from the job is not included.

On similar jobs the per-acre costs for labor and chemical ranged from $1.44 for treating only 7 trees per acre, to $7.06 for treating 131 trees per acre. In the latter case, even trees 2 inches in diameter were treated.

Persons interested in debarking trees may want to test the use of frills along with their regular debarking treatment. This is recommended if local tree species or weather conditions are much different from those found in the Adirondacks. Possibly 10 or 20 trees of each species—and including different sizes—will provide a good measure of how effective the treatment is.

### Some Details About Frills

Frills should generally be made in summer. This is especially true for species like hard or soft maple, which produce a strong sap flow. A few details will help explain the reasons for recommending summer treatments.

Enough sap can flow from frilled maples to flush out the chemicals whenever conditions are right for it. Killing has been achieved with soft maples treated with frills in February when the wood was frozen. However, sometimes when treatments were made in late fall, on warm days during the winter, or in early spring, much of the chemical was flushed out of the maples by sap. When this happened they were not completely killed.

One need not be so concerned about sap flow from beech. During treatments it generally did not occur in sufficient quantity to flush out the chemical—even when there was a strong flow of sap from nearby soft maples. (A strong flow of sap from one or two spots on some beech trees has been observed; it usually occurred near rotten wood or healed knots.) Frills have been used successfully to kill beech, when at the same time there was a strong flow of sap from soft maple and frills on them were unsuccessful. There may be other species that would react like beech, but frills have not been tested on them.

More information about bark peeling is needed. Although some success has been had in killing tight-barked trees with frills, information is lacking about the kind of peeling job the frill can do if applied while the bark is tight. A little encouraging information about this is available. The beech and red maple frilled on February 29, 1952, had some loose bark by the next spring. The bark continued to loosen and by spring of 1954 most of the maple bark and all of the beech bark was loose. Even better results were obtained on red maples frilled on August 29, 1952; two years later the bark on all these trees was loose.

So there is some hope that an effective bark-peeling treatment may be developed for use beyond the sap-peeling season. Such treatments, when successful, seem to work much more slowly than treatments made during the summer. It is now believed that the development of such a treatment will depend to a considerable extent on how long the trees can be left standing, without serious deterioration, after they are dead. If they can stand at least 2 years, perhaps a successful treatment can be developed. However, for the present it is recommended that the frill treatment be used for bark peeling only during the summer.

It is not necessary to avoid cutting into the sapwood when a frill is chopped. Ax cuts extending into the sapwood did not prevent bark peeling, nor did they cause live streaks to remain between the bark and wood. The preliminary studies with frills in 1951 showed that live streaks were not caused by the cuts extending into the sapwood. Since that time, no attempt has been made to avoid cutting the wood. It is now considered preferable to cut slightly into it because this permits better control of the ax and the chemical solution.

Frills may be chopped at different heights, depending upon whether the objective is to kill the trees or to cause bark peeling. For killing trees, the frill may be cut at any height convenient for the axman. However, if bark peeling is desired—and within 1 year—the frill should be made near stump-height. Otherwise some live bark will remain between the frill and the stump and will not peel as easily as the dead bark above the frill.

Among other studies made to

improve the frill treatment is one now underway intended to test a small frill (Fig. 3). This is considerably smaller and easier to make than the frill originally used. In addition, a battery syringe is used to put the chemical into the smaller frill. This permits better control of the solution, and there is less dripping than with a paint brush. Spattering, such as occurs with a brush, is also eliminated.

### Precautions With Sodium Arsenite

That sodium arsenite is poisonous is well known; yet it is advisable to emphasize some of the hazards involved in handling it. Whenever sodium arsenite solution is handled, care must be taken to avoid accidents to workmen or animals. In addition to the manufacturer's recommendations, it is believed that these precautions should also be taken:

1. Avoid spilling or spattering the solution on foliage or on the ground.

2. Wear water-proof gloves when applying the solution unless convinced that other measures are adequate.

3. Do not leave the chemical supply untended and exposed to curious people or animals—even when working nearby.

4. If spattering occurs, wear a plastic face shield, or at least goggles.

5. Keep all containers properly labeled.

6. Keep the chemical supply in locked storage.

7. Destroy and bury all unwanted empty containers.

8. If clothing becomes soaked with sodium arsenite solution, it should be taken off at once and not worn again until it has been washed.

These precautions are followed at the Adirondack Research Center, where sodium arsenite has been used every year since 1948. No trouble is expected from handling it as long as normal care is used. Only twice have employees been affected: once, when gloves were not worn; and another time when a workman apparently brushed his face with the back of his gloved hand. Both times small pimples developed; they disappeared within a few days after simple medical treatment.

The possibility that domestic or wild animals may find the solution if it is exposed to them should also be considered. Apparently some animals have taken in some of the chemical that had dripped onto foliage.

A need is seen for a sodium arsenite solution that contains a powerful animal repellent. Some manufacturers now make solutions that have in them chemicals to repel animals; but no tests reported have proved conclusively the effectiveness of any such repellent. One of these solutions is being used experimentally: it contains 28 percent sodium arsenite.

### Summary

The frill and sodium arsenite treatment has been found effective for both killing trees and loosening the bark. Meanwhile experiments with chemicals will be continued in an attempt to find more efficient and more economical treatments for stand-improvement.

## Edward A. Colman (1910-1956)

Edward A. Colman, chief of watershed management research for the U.S. Forest Service in California since 1949, died in Berkeley, March 20, 1956, after a brief illness. He was 45.

Dr. Colman, was known to foresters throughout the United States. He had studied forest and watershed problems for more than 25 years. As a student aid, he worked in the forests of Minnesota and Idaho. Then in 1933, after graduating from the University of California School of Forestry in 1932, he joined the staff of the California Forest and Range Experiment Station. There he specialized in soil physics and forest hydrology.

Among his contributions to forest science was an improved method of extracting moisture from soil samples. He developed this method as part of graduate studies which earned him the Ph.D. in soil science at the University of California in 1942. Through this work and subsequent studies at the California Station he invented an electrical soil-moisture meter that was granted a government patent and is being used in soils research in many parts of the world.

In 1951 Dr. Colman was granted a year's leave of absence from the Forest Service, during which he conducted a nation-wide study of water yield improvement under sponsorship of the Conservation Foundation. His findings were published by the Foundation in the book *Vegetation and Watershed Management*.

EDWARD A. COLMAN

In recent years he had laid the groundwork for a new program of snow research that the California Station is starting in an effort to improve the yield of water from the Sierra Nevada snowpack. He had also been responsible for basic studies of soil-movement and chaparral watershed hydrology in the southern California mountains.

Always a fundamentalist, Dr. Colman was at the forefront of watershed research workers seeking to understand the why of natural processes. This faith in basic research led him to accomplishments that will do him honor for all time in California and other parts of the world.

Just before his death he was appointed to the editorial board of the JOURNAL OF FORESTRY.

# Natural Forest Vegetation Zones of New England

Marinus Westveld, et al.[1]

*In recent years public and private forest surveys have marshalled a wealth of detailed type data that provide an excellent basis for compiling natural vegetation maps on a regional basis. The following article outlines the methods and principles used in preparing such a map for New England. Presented also are descriptions of the forest vegetation zones established and an allocation of S.A.F. forest cover types to the established zones.*

THE MOST reliable natural indicator of the forestry potential of a piece of forest land is to be found in its natural vegetation cover. Therefore, what forest types comprise natural groupings, and what areas they occupy are questions of practical importance to foresters.

Most attempts in this country to delinate major units of natural vegetation have been on a continent-wide basis. For regional use, the extremely broad zones shown on these maps need to be subdivided into zones of lesser magnitude.

Numerous classifications have been developed by foresters and plant ecologists for mapping forest vegetation. Some systems are based purely on floristic characteristics, others on mean temperatures or other environmental factors. Of more significance, however, are the classifications based on forest-vegetation units and probable successional trends. The latter scheme constitutes what might be termed the natural approach to the forest-classification problem in contrast to the more or less artificial approach of the former.

Examples of the natural approach are the classifications developed by Clements, Shreve, Zon, and others, which use vegetation as the criterion (*9*). These men have taken leading roles in delineating major regions of vegetation in the United States. Since these classifications involve the entire continental United States, the mapping scale used was necessarily small and the forest zones established are of considerable magnitude. For example, such an expanse of territory as New England, New York, and much of the Allegheny territory are classified into two or at most three regions. These broad regions can and should be further subdivided into zones of lesser magnitude.

Foresters and plant ecologists in recent years have made considerable progress in this direction. New England forestry literature, for example, abounds in descriptions of recognized forest zones; but attempts to delimit them graphically have been few and far between.

Recognizing the need for a more detailed forest-vegetation map for New England, the Committee on Silviculture of the New England Section, Society of American Foresters, undertook to compile such a map several years ago. Subsequently, however, a wealth of new and more detailed type data has been made available with the result that the Committee recently revised and greatly improved its map (Fig. 1).

This map, being based on natural units of forest vegetation, has high value in forestry, wildlife, and land-planning activities (*3*). The value of the natural approach derives from its ecological implications. Natural forest-vegetation zones reflect the climatic complex that determines the choice of species, the source of seed for reforestation purposes, and the limits of species composition that can be maintained under given systems of management.

Of particular value in furthering the Committee's work were the cover-type maps of New England and other forest-survey data compiled by the Northeastern Forest Experiment Station's forest survey unit. It should be borne in mind, however, that the type maps prepared by the U. S. Forest Service survey, as in most forest-survey mapping, show the current cover type. Under this scheme a spruce—fir—hardwood forest recently cut for softwoods only would be designated on the map as a hardwood type. In like manner, a natural spruce site occupied by white birch after cutting and fire would be classed as hardwoods. On the other hand, an old-field pine stand, even though it supported pure hardwoods prior to cultivation, would be mapped as a softwood type. Thus, cover-type maps, though serving a valuable purpose, can be very misleading in interpreting the inherent potentiality of the site.

The Committee's newly revised map aims to show the kind of forests that originally existed, or that are likely to develop, in each of the recognized forest zones. This objective involved the task of reconstructing the climax forests of New England. Of course opportunity for presenting a truly accurate picture of the original forest cover disappeared some two centuries ago. Lumbering, fires, and agriculture have disturbed extensive areas of climax vegetation. However, analysis of present cover types in conjunction with their topographic position has made it possible to interpret the many temporary types in terms of climax or near-climax associations. Knowledge of the successional stages in forest growth following disturbance or removal

[1]Prepared by the Committee on Silviculture, New England Section, Society of American Foresters. Membership: R. I. Ashman, H. I. Baldwin, R. P. Holdsworth, R. S. Johnson, J. H. Lambert, H. J. Lutz, Louis Swain, Myles Standish, Marinus Westveld, *chairman*.

The Committee gratefully acknowledges the valuable aid rendered by more than 50 individuals and agencies in New England who contributed in one form or another. Special thanks are due Henry W. Hicock and Jerry S. Olson of the Connecticut Agricultural Experiment Station.

of the original forest, and the relations between these plant associations, soils, and topographic features proved to be a valuable aid (*10*).

As mapped by the Committee, New England comprises six major natural forest subdivisions or forest zones. The boundaries of these zones were determined by grouping together those types that possess recognizable similarities as to site conditions and especially by the representation of several principal dominant key species. The pattern formed by the occurrence of these type groups furnished the basis for demarking forest zone boundaries. These boundaries are usually well defined, but merge into each other where there is a gradual transition from the conditions favorable to one zone to those favorable to another.

Owing to its generalized nature, a zonal map lacks detailed accuracy. Thus the forest cover depicted on the map may not at all times correspond to that encountered on the ground. It is to be expected that within an area designated as a distinct forest zone there will be small islands and belts here and there supporting types that supposedly are not endemic to the zone and that theoretically belong to forest zones to the north or to the south. These "intruders" may be considered as being northward or southward extensions of types and owe their presence to favorable edaphic conditions.

The names used to designate the six zones are derived from several tree species that characterize the zone rather than a single species of high economic values, as has been commonly done in the past. The names used—representative species of the hardwood and softwood components in stands—are in keeping with the character of New England's forests, which run strongly to mixtures of hardwoods and softwoods, with hardwoods dominant in all zones with the possible exception of the Spruce—Fir—Northern Hardwoods Zone.

To enable the forester to correlate forest-cover types with the regional forest map of New England (Fig. 1), the Committee has allocated the official S.A.F. cover types endemic to New England to the proposed forest zones (Table 1). In recognition of the fact that any given forest zone will have not only climax types but also temporary types representing various stages of succession, temporary as well as permanent types are included. Moreover, a specific cover type may be listed in two or more zones. Those types that characterize a given zone nave been italicized in the listings. Of the 106 cover types shown for eastern North America in the most recently revised S.A.F. cover-type publication (*8*) 38 occur in New England.

### Zone 1
### Spruce—Fir—Northern Hardwoods

The most northerly zone, referred to in the past as spruce or spruce—fir, has been renamed the Spruce — Fir — Northern Hardwoods Zone in recognition of the principal species comprising the softwood and hardwood components of these stands. Foresters recognize two subdivisions in this zone (*11*): one in which the hardwood component consists principally of the tolerant beech, yellow birch, and sugar maple, the other in which the hardwood component consists of the intolerant paper birch, aspen, and frequently red maple. The latter tend to occupy the higher mountain elevations above the limits of the tolerant species mentioned or swamps and poorly drained areas adjacent to streams and lakes. These sub-zones are so intermingled as to defy demarcation on a zonal map.

Composition varies with forest type. Pure spruce—fir stands are commonly encountered on high slopes, old-field associations, and swamps. On the high slopes red spruce predominates; on old fields white spruce is frequently found as an associate; in swamps black spruce is the key species with tamarack and northern white-cedar frequently present. On the lower slopes and well-drained flats, beech, sugar maple, and particularly yellow birch, are common components. Red spruce, the indicator species, is usually in the minority. On the shallower more slowly drained soils, red maple, paper birch, aspen, black ash, cedar, tamarack, and white pine occur frequently. Mountain and striped maple are common understory trees, particularly in the tolerant hardwood subdivisions, and less frequently, mountain-ash. Hemlock occurs in both subdivisions but is more common at the lower elevations in the tolerant hardwood division. In some sections, as in parts of eastern Maine, it may be the predominant conifer. Abandoned fields and pastures are quickly taken over by red and white spruce. While these species usually dominate, balsam fir is often a prominent member. Not infrequently white pine and northern white-cedar occur scatteringly. The temporary paper birch, aspen, and pin cherry stands so commonly encountered are the result principally of fire or windthrow.

The Spruce — Fir — Northern Hardwoods Zone extends from the Berkshires in western Massachusetts northward through the Green and White Mountains and northeastern Maine. It occupies elevations from sea level in eastern Maine to 4,500 feet in the mountainous portions of New England. The soils of this region are strongly podsolized.

### Zone 2
### Northern Hardwoods—Hemlock—White Pine

The forests of this zone strongly resemble the Tolerant Hardwood subdivision of Zone 1; however, white pine and hemlock, rather than red spruce, characterize the softwood component. Beech, sugar and red maple, and yellow birch dominate the forests. Hemlock, white pine, and occasional red and white spruce and balsam fir occur in mixture with light representations of white ash, black cherry, sweet birch, paper birch, northern red oak, American elm, and basswood. In the understory occur occasional horn beam and hophorn beam. Old field associations in this zone are dominated by white pine with additions of hemlock and occasional spruce and balsam fir. As

TABLE 1.—ALLOCATION OF S.A.F. FOREST COVER TYPES IN NEW ENGLAND TO NEW ENGLAND FOREST ZONES[1]

| Zone | S.A.F. type no. | Stage in succession |
|---|---|---|
| 1. *Spruce—Fir—Northern Hardwoods* | | |
| A. Spruce—Fir—Intolerant Hardwoods | | |
| *Red spruce—balsam fir* | 33 | Climax |
| *Paper birch—red spruce—balsam fir* | 35 | Sub-climax |
| *Red spruce* | 32 | Climax |
| *Balsam fir* | 5 | Climax or sub-climax |
| White spruce—balsam fir—paper birch | 36 | Climax |
| Black spruce | 12 | Climax |
| Tamarack | 38 | Sub-climax |
| Northern white-cedar | 37 | Climax |
| Jack pine | 1 | Pioneer |
| Paper birch | 18 | Pioneer |
| Aspen | 16 | Pioneer |
| Pin cherry | 17 | Pioneer |
| B. Tolerant Hardwoods—Spruce—Fir | | |
| *Red spruce—yellow birch* | 30 | Climax |
| *Red spruce—sugar maple—beech* | 31 | Climax |
| Hemlock | 23 | Climax |
| Hemlock—yellow birch | 24 | Sub-climax |
| Sugar maple—beech—yellow birch | 25 | Climax |
| Paper birch | 18 | Pioneer |
| Aspen | 16 | Pioneer |
| Pin cherry | 17 | Pioneer |
| 2. *Northern Hardwoods—Hemlock—White Pine* | | |
| *Sugar maple—beech—yellow birch* | 25 | Climax |
| *White pine* | 21 | Sub-climax |
| *Hemlock* | 23 | Climax |
| Sugar maple | 27 | Climax |
| Northern red oak | 55 | Sub-climax |
| Red pine | 15 | Sub-climax |
| Paper birch | 18 | Pioneer |
| Aspen | 16 | Pioneer |
| Gray birch—red maple | 19 | Pioneer |
| Pin cherry | 17 | Pioneer |
| 3. *Transition Hardwoods—White Pine—Hemlock* | | |
| *White oak—red oak—hickory* | 52 | Climax or sub-climax |
| *Northern red oak—basswood—white ash* | 54 | Climax or sub-climax |
| *White pine—northern red oak—white ash* | 20 | Climax or sub-climax |
| *White pine—hemlock* | 22 | Climax or sub-climax |
| *Hemlock* | 23 | Climax |
| Northern red oak | 55 | Climax or sub-climax |
| Paper birch | 18 | Pioneer |
| Aspen | 16 | Pioneer |
| Pin cherry | 17 | Pioneer |
| Pitch pine | 45 | Sub-climax |
| 4. *Central Hardwoods—Hemlock—White Pine* | | |
| White pine—red oak—white ash | 52 | Climax or sub-climax |
| White pine—hemlock | 22 | Climax or sub-climax |
| *Hemlock* | 23 | Climax |
| Northern red oak | 55 | Sub-climax |
| White oak | 53 | Climax |
| Gray birch—red maple | 19 | Pioneer |
| Pitch pine | 45 | Sub-climax |
| Eastern redcedar | 46 | Pioneer |
| 5. *Central Hardwoods—Hemlock* | | |
| *White oak—red oak—hickory* | 52 | Climax or sub-climax |
| Yellow-poplar—white oak—northern red oak | 59 | Climax or sub-climax |
| *Chestnut oak* | 44 | Climax |
| *Eastern redcedar* | 46 | Pioneer |
| *Hemlock* | 23 | Climax |
| White oak | 53 | Climax |
| Black ash—American elm—red maple | 39 | Climax |
| River birch-sycamore | 61 | Climax or sub-climax |
| Gray birch—red maple | 19 | Pioneer |
| Silver maple—American elm | 62 | Sub-climax |
| Atlantic white-cedar | 97 | Climax |
| Beech—sugar maple | 60 | Climax |
| Scarlet oak | 41 | Sub-climax |
| Bear Oak | 43 | Sub-climax |
| Pitch pine | 45 | Sub-climax |
| 6. *Pitch Pine—Oak* | | |
| Scarlet oak | 46 | Sub-climax |
| *Pitch pine* | 45 | Sub-climax |
| *Bear oak* | 43 | Sub-climax |
| Chestnut oak | 44 | Climax |
| White oak—red oak—hickory | 52 | Climax or sub-climax |

[1]The italicized types are those that characterize the zone.

in the Spruce — Fir — Northern Hardwood Zone, destructive fires are usually followed by stands of aspen and paper birch.

This zone just barely reaches into northwestern Connecticut; it covers much of western Massachusetts, southern and central Vermont and New Hampshire and southwestern Maine as a belt extending along the southern edge of the Spruce — Fir — Northern Hardwood Zone. Hickories and oaks other than red oak are absent except near the southern margins of the zone where they are generally restricted to dry hilltops, knobs, and outwash soils. Red oak may be common throughout and accounts for considerable areas having been typed as oak—hickory in the past. In the north the forests of this zone attain best development on the lower hills and ridges, giving way at higher elevations to types in which spruce and fir supplant white pine and hemlock. Soils are far less strongly podsolized than in the Spruce—Fir—Hardwood Zone and duff mull soils are of frequent occurrence.

### Zone 3
### Transition Hardwoods—White Pine—Hemlock

The Transition Hardwoods—White Pine—Hemlock Zone, as the name implies, contains a variety of species characteristic of the zones immediately to the north and south of it. Here the beech, birches, and maples of the north overlap the oaks and hickories of the central regions. Thus the majority of hardwoods endemic to New England occur in this zone. These may occur in the same forest or northern and southern types may alternate in a mosaic. A variety of oaks and hickories tend to occupy hilltops and sandy terraces, along with white pine, some paper birch, quaking and big toothed aspen and occasionally red pine; but typical northern hardwood stands may occur on lower slopes and coves, especially on heavier soils. On the latter sites, white ash, red oak, and black birch often reach a greater degree of abundance than that attained either north or south, but they are so widespread elsewhere that they can hardly be considered as indicators by themselves.

This zone is part of what used to be called the White Pine Region when old-field white pine covered a large percentage of the landscape. This is in marked contrast to the original forest, which tended strongly toward an all-aged forest consisting of a wide variety of hardwoods, principally chestnut, red oak, white ash, red maple, and sugar maple with admixtures of white oak, beech, basswood, ironwood, white pine, and hemlock (*1, 2, 5*).

Studies at the Harvard Forest (*7*) have shown clearly that white pine, the characteristic tree in old-field associations, is only a stage in succession that follows abandonment of land for agricultural use. After cutting of pine there is a strong tendency toward greatly increased representation of hardwoods, especially on the heavier and richer soils. In light sandy soils, white pine is more easily maintained as a permanent type. Heavy cuttings in the past, and particularly during the recent war years, have left much of the forests of the region in a depleted and deteriorated condition.

The Transition Hardwoods—White Pine—Hemlock Zone occupies southwestern Maine and most of southern New Hampshire. It covers much of eastern and central Massachusetts and a small area in Connecticut around the town of Union. A larger tongue reaches into northwestern Connecticut, skirting the lower boundary of the Northern Hardwoods—Hemlock—White Pine Zone. A belt follows up the Champlain Valley and a narrow strip extends along the Connecticut River Valley of Vermont and New Hampshire. The soils in this zone are preponderantly of the brown podzolic group. Though incipient true podzol mor profiles are frequently encountered, duff mull and even true mull soils are more common.

### Zone 4
### Central Hardwoods—Hemlock—White Pine

The boundary between this zone and the Transition Hardwoods—White Pine—Hemlock Zone is not easy to establish. The line established by Raup (*6*) which marks the boundary between the redcedar and white pine old-field succession was assumed to correlate with the hardwoods boundary. In Connecticut the boundary was drawn where sugar maple, beech, or yellow birch taper off to a lesser abundance than they had further north. White birch, which is conspicuous in the Transition Hardwoods Zone, is very local except in the northern fringe of the central hardwoods.

This zone is characterized by an abundance of so-called central hardwoods with black oak, red oak, white oak, chestnut, shag bark and bitternut hickories the dominant species. Usually present also are red maple, chestnut oak, scarlet oak, and black birch. Chestnut, prior to the blight, was an important species in this zone. Since its destruction, it has been largely supplanted by the oaks.

Unlike Zone 5 to the south, white pine is still abundant on sandy sites and some old fields, but it may be absent over large intervening areas because of heavier soils or for historical reasons. Although some white pine is usually present, eastern redcedar tends to dominate old-field associations in this zone.

The Central Hardwoods—Hemlock—White Pine Zone extends from southeastern New Hampshire and southwestern Maine southward through eastern Massachusetts to a roughly east-west line extending across central Connecticut and Rhode Island except as noted in Zones 2 and 3. It includes and replaces the "Tension Zone" shown in previous maps, which reflected the overlapping of pine from the north and central hardwoods from the south.

### Zone 5
### Central Hardwoods—Hemlock

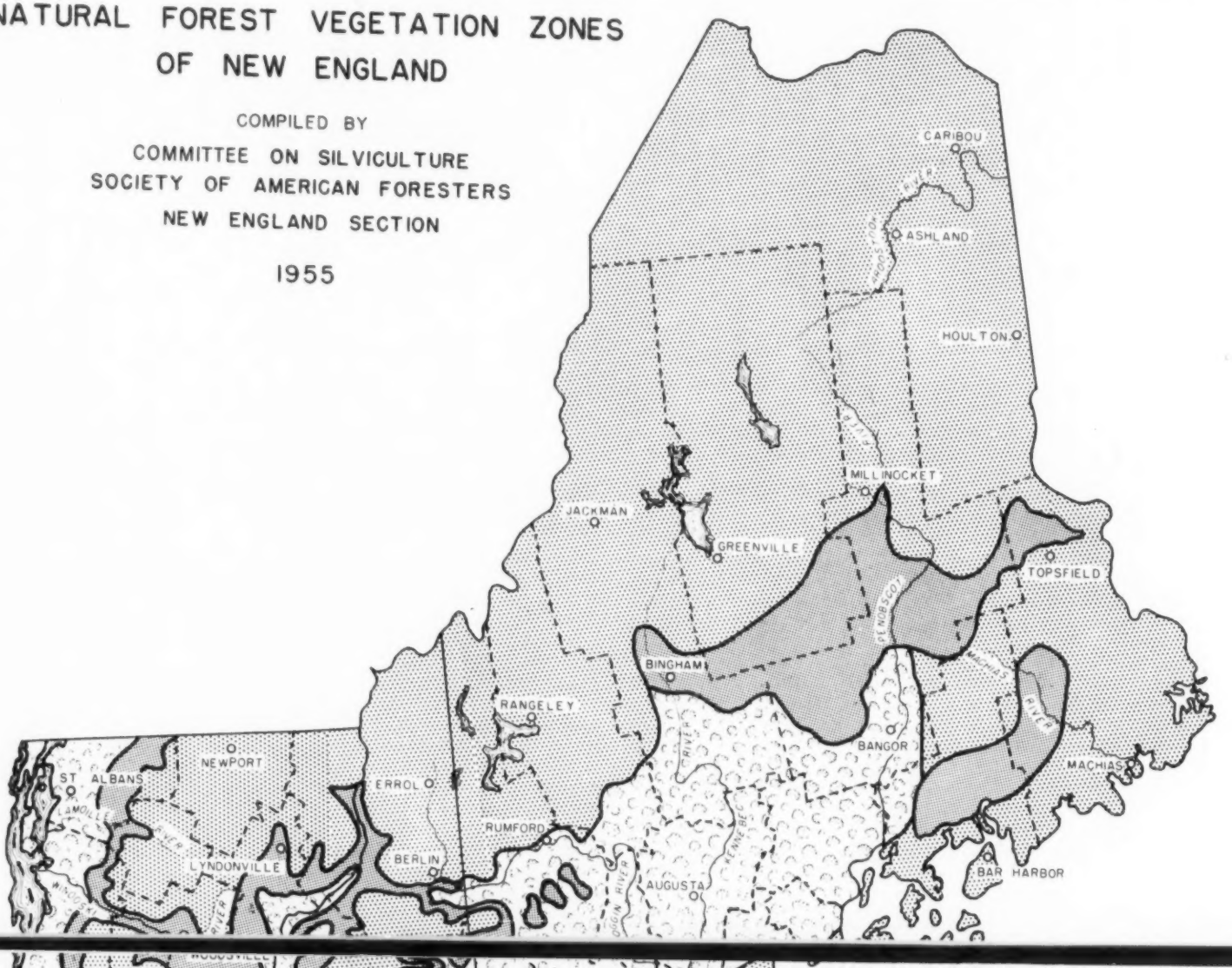
Zone 5, Central Hardwoods—Hemlock, is strongly dominated by a wide variety of central hardwoods. The key conifer species in this zone is undoubtedly hemlock, though over extensive areas it occurs only as scattered specimens and groups of reproduction which

# NATURAL FOREST VEGETATION ZONES OF NEW ENGLAND

COMPILED BY

COMMITTEE ON SILVICULTURE
SOCIETY OF AMERICAN FORESTERS
NEW ENGLAND SECTION

1955



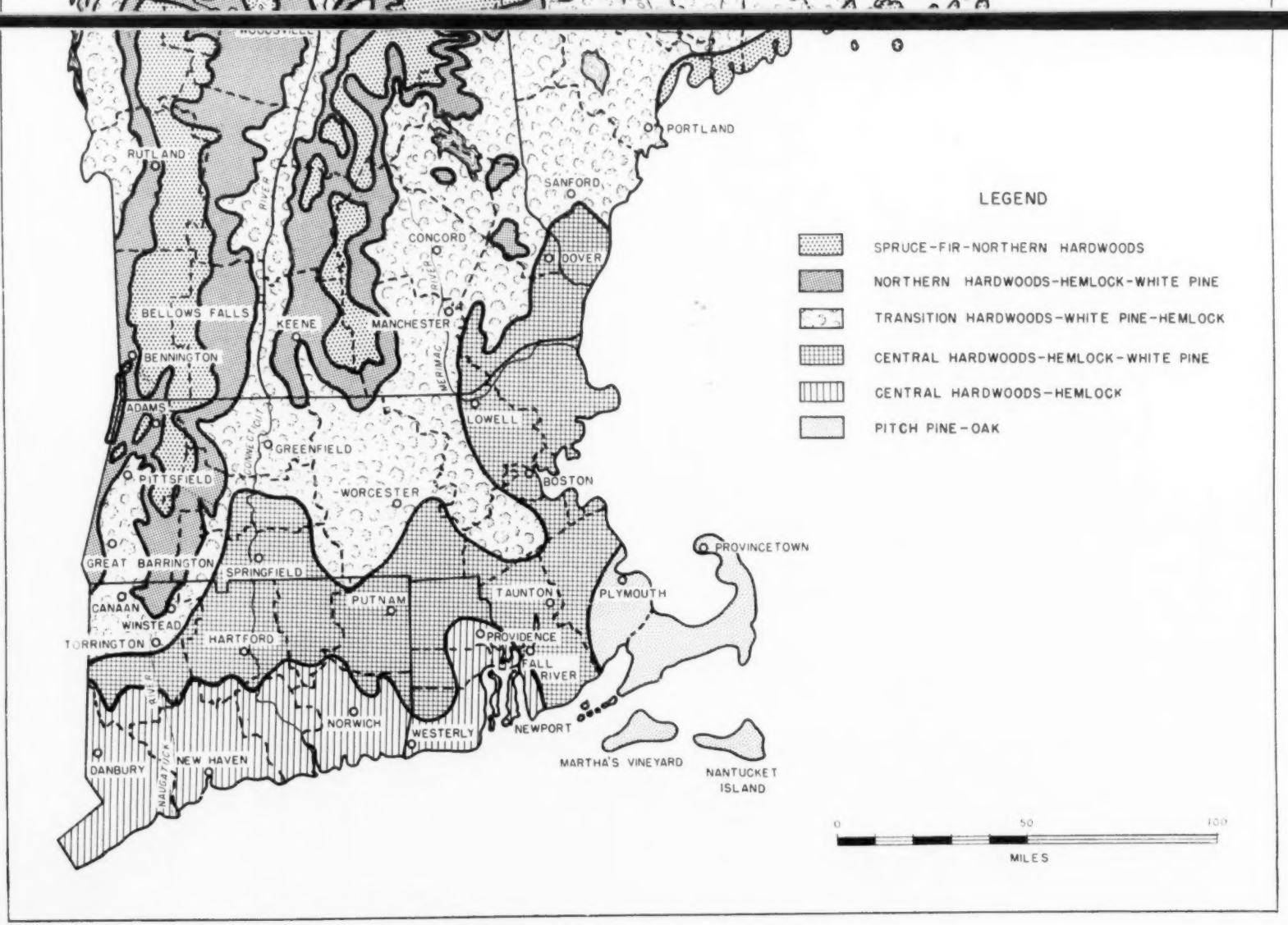



Fig. 1.—Natural Forests Zones of New England.

TABLE 2.—COMMON AND SCIENTIFIC NAMES OF TREE SPECIES MENTIONED

| Common name | Scientific name | Common name | Scientific name |
|---|---|---|---|
| Ash, black | *Fraxinus nigra* | Maple, mountain | *Acer spicatum* |
| white | *Fraxinus americana* | red | *Acer rubrum* |
| Aspen, big tooth | *Populus grandidentata* | striped | *Acer pensylvanicum* |
| quaking | *Populus tremuloides* | sugar | *Acer saccharum* |
| Basswood | *Tilia* spp. | Mountain-ash, American | *Sorbus americana* |
| Beech, American | *Fagus grandifolia* | Oak, bear | *Quercus ilicifolia* |
| Birch, black | See birch, sweet | black | *Quercus velutina* |
| gray | *Betula populifolia* | chestnut | *Quercus prinus* |
| paper | *Betula papyrifera* | northern red | *Quercus rubra* |
| sweet | *Betula lenta* | post | *Quercus stellata* |
| yellow | *Betula alleghaniensis* | scarlet | *Quercus coccinea* |
| Cherry, black | *Prunus serotina* | white | *Quercus alba* |
| pin | *Prunus pensylvanica* | Pine, eastern white | *Pinus strobus* |
| Chestnut | See chinkapin | pitch | *Pinus rigida* |
| Chinkapin | *Castanea* spp. | red | *Pinus resinosa* |
| Elm, American | *Ulmus american* | Redcedar, eastern | *Juniperus virginiana* |
| Fir, balsam | *Abies balsamia* | Spruce, black | *Picea mariana* |
| Hemlock, eastern | *Tsuga canadensis* | red | *Picea rubens* |
| Hickory, bitternut | *Carya cordiformis* | white | *Picea glauca* |
| shagbark | *Carya ovata* | Tamarack | *Larix laricina* |
| Hophornbeam, eastern | *Ostrya virginiana* | White-cedar, northern | *Thuja occidentalis* |
| Hornbeam, American | *Carpinus caroliniana* | Yellow-poplar | *Liriodendron tulipfera* |

have expanded in the few decades since fires have been well controlled. Studies by Lutz (*4*) and others indicate its present paucity is due to repeated heavy cutting and fire and that it is now in process of becoming dominant over wide areas in this zone.

Various species of oaks and hickories are prominent constituents of the stand. Very locally sugar maple, beech, yellow-poplar, and red oak may occupy the better sites associated with lower slopes, coves, swales, and valley bottoms. On sandy sites and thin-soiled ridges and slopes xerophytic species, principally black, scarlet, chestnut, and bear oaks may dominate the stands. The characteristic tree of abandoned fields and pastures in this zone is the eastern redcedar.

This zone in New England is restricted mostly to central and southern Connecticut, and southern Rhode Island. Mull and duff mull soils are both common but true podzol mors are of rare occurrence and localized.

## Zone 6
## Pitch Pine—Oak

Zone 6, Pitch Pine—Oak, occupies a relatively small area in New England. It occurs primarily on Cape Cod in extreme eastern Massachusetts and the two islands of Martha's Vineyard and Nantucket. A few outlyers occur in the sand plain areas of Rhode Island, Connecticut, and Massachusetts where pitch pine and mixtures of white, black, and red oak vie for dominance. It is only a small part of an extensive zone reaching south into the New Jersey pine barrens.

The soils of the region belong to the sandy podzol group. In general, they are light and support mixed stands of oaks and pines. On the very poor dry soils pitch pine dominates. On the better soils oaks, particularly post oak and bear oak, appear in considerable numbers. Repeated fires encourage the increase of pitch pine and scrub oak. Fires and repeated cuttings have left the majority of the stands in poor condition with slow-growing unhealthy trees.

## Literature Cited


1. BROMLEY, S. W. 1935. The original forest types of southern New England. Ecol. Monog. 5:61-89.
2. FISHER, R. T. 1933. New England forests: biological factors in New England's prospect, 1933. Amer. Geog. Soc. Spec. Pub. 16:213-223.
3. KÜCHLER, A. W. 1953. Some uses of vegetation maps. Ecol. 34:629-633.
4. LUTZ, H. J. 1928. Trends and silvicultural significance of upland forest succession in southern New England. Yale Univ. School Forestry Bul. 22.
5. NICHOLS, G. E. 1935. The hemlock-white pine-northern hardwood region of eastern North America. Ecol. 16: 403-422.
6. RAUP, H. M. 1940. Old field forests of southern New England. Jour. Arnold Arboretum 21:266-273.
7. ———, and R. E. CARLSON. 1941. The history of land use in the Harvard Forest. Harvard Forest Bul. 20.
8. SOCIETY OF AMERICAN FORESTERS. 1954. Forest cover types of North America. Washington.
9. TOUMEY, J. W., and C. L. KORSTIAN. 1937. Foundations of silviculture upon an ecological basis. John Wiley & Sons, New York.
10. WESTVELD, MARINUS. 1951. Vegetation mapping as a guide to better silviculture. Ecol. 32:508-517.
11. ———. 1953. Ecology and silviculture of the spruce-fir forests of eastern North America. Jour. Forestry 51:422-430.


*Note:* The forest vegetation map of New England in a 6-color edition measuring 18 by 26 inches can be obtained for 50 cents per copy postpaid (or 25 cents per copy for 10 or more maps) from:

Fred E. Holt
Sec.-Treas., New England Section, S.A.F.
Maine Forest Service
State House
Augusta, Maine

# Notes

## Evidence of Shock Following Thinning of Young Douglas-Fir

Foresters are prone to warn against thinnings that may result in "shock" to the residual stand. Just what shock is, or under what conditions it is likely to occur has apparently never been fully demonstrated. Hawley and Smith[1] state that shock is simply failure of the tree to respond to thinning (presumably in diameter growth). They ascribe this failure to the fact that thinning may bring about changes that sharply increase cambium respiration. If the foliar area of the tree is small in comparison to the cambial area, there may be insufficient carbonhydrates manufactured to supply the higher rate of respiration and still leave a surplus for growth. In extreme cases the tree may succumb. Quantitative experimental data to substantiate this view will be very difficult to obtain. Certainly this problem in tree physiology is of considerable importance.

The effect of shock, likewise, seems to have been seldom, if ever, measured in quantitative terms. Measuring the effect, however, is comparatively simple if some variable such as change in height or diameter growth is chosen. A recent thinning of a Douglas-fir (*Pseudotsuga menziesii*) plantation in the Wind River Experimental Forest on the Gifford Pinchot National Forest in Washington provided an opportunity for such an appraisal of shock.[2]

The plantation, which occupies part of the 1902 Yacolt burn, was established in 1930 on Site IV land. At 23 years of age the 600 to 650 trees per acre averaged approximately 29 feet tall and 4 inches in diameter breast high. Limbs on about the lower one-third of the stem were dead, and diameter increment had slowed down slightly in recent years, presumably as a result of competition.

TABLE 1.—LEADER LENGTH FOR 3 YEARS IN THE THINNED AND UNTHINNED STANDS OF DOUGLAS-FIR

| Treatment | Trees in sample | Average length of leader 1953 | 1954 | 1955 |
|---|---|---|---|---|
| | *Number* | | *Inches* | |
| Unthinned | 10 | 13.4 | 14.5 | 15.8 |
| Thinned: | | | | |
| Replication 1 | 30 | 21.5[1] | 10.4 | 7.7 |
| Replication 2 | 30 | 20.2[1] | 15.4[2] | 8.4 |

[1]Before thinning.
[2]Thinned in middle of growing season.

Very radical thinnings (to 50, 100, 150, 200, 250, and 350 trees per acre) were made to determine how many trees should be left after an early precommercial thinning. Each thinning was carried out on a ½-acre plot plus isolation strip, and the whole replicated twice. Unthinned plantation surrounds the thinned plots. Replication One was thinned after the 1953 growing season, and Replication Two during the 1954 growing season. Remaining trees were pruned at the time of thinning to approximately one-third their total height. Pruning removed almost no live limbs.

Height growth in the thinned plots fell off sharply in the first season after treatment. Following the 1955 growing season careful measurements were made to establish the extent of the reduction. All measurements were made with a transit set up in a position where at least 10 trees in a single thinning treatment could be seen. From these, 5 were chosen at random and the length of the 1955, 1954, and 1953 leaders measured. Ten trees from the adjacent unthinned stand were measured similarly.

The reduction in leader length after thinning is very striking (Table 1). The differences in leader length between the thinned and unthinned stands and between the different years is of high statistical significance. However, no statistically significant difference in leader length was found between the different thinning intensities. This was expected, because even in the lightest thinning (350 trees to the acre) remaining trees were completely released. The shorter 1953 leaders in the unthinned area are probably due to the inclusion of sub-dominant trees in the random sample, whereas only dominants were left in the thinned areas.

Although the average leader length increased from 1953 to 1955 in the unthinned stand, it fell off very sharply following thinning on all thinned plots. Furthermore, although the evidence is inconclusive, it appears that the effect of thinning on height growth was immediate. Leaders in Replication Two were substantially shorter in 1954 than in 1953, even though the thinning took place *during* the 1954 growing season. Reduction was not so pronounced, however, as in Replication One, which was thinned *before* the 1954 growing season began.

The reduction in height growth is considered to be evidence of shock. It throws no light on just what shock is. Reduction of height growth, and other measurable evidence of shock will continue to be observed in this thinning, even though secondary to the major objective of the experiment.

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*Forest Service,*
*U. S. Department of Agriculture*

[1]Hawley, Ralph C., and David M. Smith. The practice of silviculture. 6th edition (p. 364). New York. 1954.
[2]U. S. Forest Service, Pacific Northwest Forest and Range Experiment Station. Annual report 1954 (p. 18). Portland, Oregon. 1955.

## Complete Frilling Essential for Hardwood Control[1]

The use of 2,4,5-T in frills for killing undesirable hardwoods has proven to be an effective method when properly applied. However, the lack of emphasis on the necessity of making a complete frill was responsible for giving only a 46 percent kill on a 200 acre tract in west Georgia.

The landowner used a 2½ percent by volume water concentration of Swift's "Gold Bear Brand 5 5" 2,4,5-trichlorophenoxyacetic acid (butoxy ethoxy propanol ester), and employed local, unskilled labor.

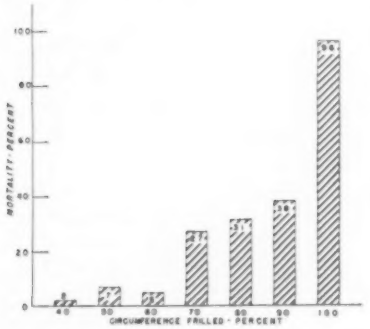


FIG. 1.—Relationship of circumference frilled to mortality.

As a result, an investment by a small landowner in a timber stand improvement operation was virtually lost. Repetition could seriously handicap a program attempting to encourage the wider use of chemicals in combatting the invasion of undesirable hardwoods in pine stands.

TABLE 1.—DISTRIBUTION OF SAMPLED TREES BY PERCENTAGE OF CIRCUMFERENCE FRILLED

| Circumference frilled | Trees dead | Total trees sampled |
|---|---|---|
| *Percent* | *Number* | *Number* |
| 10 | 0 | 8 |
| 20 | 0 | 19 |
| 30 | 0 | 20 |
| 40 | 1 | 60 |
| 50 | 7 | 107 |
| 60 | 6 | 112 |
| 70 | 30 | 112 |
| 80 | 35 | 113 |
| 90 | 25 | 65 |
| 100 | 346 | 360 |
| Total | 450 | 979 |

[1]This study was supported by the Georgia Forest Research Council.

When properly used, the frill-poison method gave an acceptable 96 percent kill of inspected trees following the second growing season. In contrast, on the same area, a 90 percent frill resulted in only 38 percent kill. Wide areas of incised cambium were bridged by rapid callus growth from even the smallest nonfrilled zones. The percent of trees killed decreased with the percent of circumference frilled. None of the trees died which were less than 30 percent frilled (Table 1). This indicates little lateral translocation of 2,4 5-T growth regulator when diluted with water.

When checked separately hickory, black oak, and white oak species groups reacted similarly to various degrees of frilling. Apparently, tree size, which ranged from 2 to 21 inches d.b.h., did not influence mortality aside from completeness of frill.

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L. C. WALKER
*University of Georgia, Athens*

## Use of Age at D.B.H. as a Variable in the Site Index Concept

The concept of site index as a measure of site quality has proven to be reliable and useful. Site index is defined as the average height of the dominant and codominant trees in an even-aged stand at a certain age, usually taken as 50 years in the eastern United States and 100 years in the West.

In the classification of a particular area into a site index class it is necessary to measure two characteristics of the stand, height and age. The measurement of height requires no further comment here. It is the age variable that seems to require some scrutiny. Age has generally meant the average total age of the stand dating back to its origin. As has been pointed out numerous times a criticism of the site index method is that a reliable determination of total age for most species requires an increment boring at some convenient place near the base of the tree. Then an estimate must be made of the number of years it took to attain the height at which the boring was made. This correction requires a separate study correlating height with age for trees of the particular species in the seedling and sapling stages.

It is proposed that we modify our interpretation of the age variable. Instead of site index being based on total stand age let us base it on total age at some common reference point. The reference point that immediately comes to mind is at d.b.h. There seems to be much to commend the choice of this position for age determinations.

1. This represents a height when most species have passed through their period of initial establishment and adjustment to the site. For example the total age of a species such as longleaf pine with its early "grass" stage is difficult to determine.

2. Most species do not exhibit their characteristic growth abilities until they have at least reached d.b.h.

3. D.b.h. represents a standard point with which all American foresters are familiar.

4. Basing age at the d.b.h. point eliminates the necessity of adding on a flat correction factor. It will in no way invalidate the comparative relationship if this constant is merely eliminated from the picture.

Preliminary site index curves for white pine in southeastern New Hampshire were prepared using this approach.[1] No procedural modification is necessary in site index curve construction when age at d.b.h. instead of total age is used.

B. HUSCH
*Associate professor of forestry, New Hampshire Agricultural Experiment Station,[2] Durham*

[1]Husch, B. Preliminary site index table for white pine in southeastern New Hampshire. Forestry Mimeograph No. 1. Dept. of Forestry, University of New Hampshire, Durham, 1954.

[2]Maintained by the University of New Hampshire, Department of Forestry, Durham.

# The Calculation of the Sampling Error of a Cruise from the Mean Square Successive Difference

The sampling error of a systematic cruise is usually smaller than indicated by the calculated standard error. With evenly spaced strips or cruise lines, each sampling unit may be considered as being placed in the middle of a roughly rectangular block, thus giving a better estimate of the volume of that block than a sample placed at random. This is particularly true if the volume gradually either increases or decreases from one strip to the next. The bias in the calculated standard error of a cruise due to stratification can be greatly reduced by calculating one half of the mean square successive difference ($\frac{1}{2}\ \delta^2$) of the average volume per strip or line. The mean square successive difference yields an unbiased estimate of the true sampling variance $\sigma^2$ but the efficiency of $\delta^2$ is not as high as that of the variance $s^2$. Nevertheless, this loss in efficiency may be more than compensated by the reduction of bias in the estimation of the accuracy of a forest cruise.

*Example:* The use of $\delta^2$ as a quick method of calculating the sampling error of a cruise is most easily appreciated by working through an actual example. A line plot cruise of a 393 acre tract in the beech-birch-maple-hemlock type in northern Pennsylvania yielded the following average volumes per acre for each cruise line:

| Cruise line | Volume per acre cords | Difference | (Difference)$^2$ |
|---|---|---|---|
| 1 | 13.0 | 5.0 | 25.0 |
| 2 | 18.0 | 6.0 | 36.0 |
| 3 | 24.0 | −1.3 | 1.7 |
| 4 | 22.7 | 6.0 | 36.0 |
| 5 | 28.7 | | |
| Sum | 106.4 | | 98.7 |
| Average | 21.3 | | |

The calculated volumes per acre are assumed to be of equal weight. This implies that the same number of plots have been measured on each cruise line. Slight variations in the number of plots from line to line affects the calculated sampling error only slightly. If the average number of plots per line is 10, variations from 8 to 12 are permissible. In the above example we find for the mean square successive difference

$$\delta^2 = 98.7/(5-1) = 24.7$$

and

$$\tfrac{1}{2}\delta^2 = 12.3$$

$$\delta/\sqrt{2} = 3.5$$

The last figure represents an unbiased estimate of the standard deviation between per acre volumes. The standard error of the average volume per acre (106.4/5=21.3) is $\sqrt{5}$ times smaller ($3.5/\sqrt{5}=1.6$) so that average volume per acre $=21.3 \pm 1.6$ cords. The standard error of the arithmetic average may be corrected for limited population if the cruising percentage is larger than five or ten percent.

*Note on Theory:* The exact mathematical distribution of $\delta^2$ has not yet been established and accurate tests of significance based on this statistic are therefore not available. In situations where no stratification is present $\delta^2$ cannot be as efficient an estimate of the true variance $\sigma^2$ as the sampling variance $s^2$. However, the loss in efficiency is small, particularly if the distribution of the sampling errors is not exactly normal but slightly more peaked than the normal distribution. Surprising at first glance is the fact that the relative efficiency of $\delta^2$ as compared to $s^2$ increases as the number of observations decreases. It becomes equal to that of $s^2$ for $N=2$, a case with which foresters are familiar, as it represents the case when just two sampling units are used in each block. In this situation the variance $s^2$ is equal to $(X_1 - X_2)^2/2$ which is identical with $\delta^2/2$.

The reduced efficiency of the statistic $\delta^2$ has an important bearing on the calculation of the limit of error of a cruise. The limit of error which will be exceeded with a probability of 0.05 must be slightly larger than the limit of error calculated from the $t$-distribution. Empirical tests and calculations based on the moments of the mean square successive difference indicate that the limit of error will be about 25 percent greater than in the case in which the $t$-distribution properly applies, for this reason the ordinary error limit should be multiplied by 1.25. In our example, the value of $t$ for 4 degrees of freedom is equal to 2.8. Using the mean square successive difference for the determination of the sampling error, the limit of error corresponding to a probability of 0.05 would be equal to $21.3 \pm 1.6 \cdot 2.8 \cdot 1.25$ or $21.3 \pm 5.6$.

An excellent account of the mathematical properties and possible uses of the mean square successive difference is given by Moore.[1] The paper by Moore contains a long list of references which will be of interest to foresters engaged in research on sampling.

H. ARTHUR MEYER[2]

[1]Moore, P. G. The properties of the mean square successive difference in samples from various populations. Jour. American Stat. Assoc. 50:434-456. 1955.

[2]Deceased. The late Dr. H. Arthur Meyer was professor of forestry at The Pennsylvania State University. This Note was submitted shortly before his death on December 3, 1955.

**Correction**

In the Note by Frank A. Bennett on page 267 of the April issue of the JOURNAL entitled "Growth of Planted Slash Pine on Cutover Lands and Old Fields" a typographical error occurs in Table 1. The figure 11.6 under mean height for Area 1, Field (2 yrs.) should read 5.6 *not* 11.6.

# Reviews

**Forest and Range Policy: Its Development in the United States**

By Samuel Trask Dana. 455 pp. McGraw-Hill Book Co., New York, 1956. $6.50.

As a student of history, a teacher of resource management, and a professional forester for forty years, Samuel T. Dana is perhaps better qualified than any other American to write this book. It is one of the outstanding contributions to American forestry literature of all time.

In the Preface, Dana sets the stage by explaining that "A single policy for an entire country in the handling of its forests, range lands, and other natural resources is possible only when the central government has complete authority to dictate the courses and methods to be followed by both public and private agencies. The other extreme is found in a country like the United States where there not only may be, but are, as many policies as there are governmental units and private forest owners. There is, however, at any given time sufficient similarity among these various policies to form a somewhat indistinct but nevertheless recognizable pattern for the country as a whole."

It is this "indistinct but recognizable pattern" that Dana then proceeds to define, to analyze, and explain with conspicuous success. He strives for, and succeeds in reaching, that most elusive of all goals of the writer on history and policy—objectivity.

Dana's volume inevitably invites comparison with Greeley's *Forest Policy*, published in 1953, also by McGraw-Hill. Only in part do the two books duplicate each other; in the main they are complementary. Whereas half of Greeley's book deals with forest policy in foreign nations, Dana's is wholly devoted to forest and range policy in America.

The treatment is different too. Greeley originated his material by subject matter; *e.g.* "Private Forest Management in the United States," "Forest Taxation," and "Current Problems of American Forestry." Dana's approach is essentially chronological. He discusses the evolution of federal, state, and private policies by periods of time, beginning with "Colonists, Kings, and Forests" and ending with "Forestry Comes of Age."

As is to be expected in a work of this type, Dana devotes much of his book to federal policies and their development through executive orders and legislation. However, the growth of state policy is not neglected; for example, he has made a roundup of information on state legislation in cutting practices that is both comprehensive and concise.

His sense of history is especially effective in his discussion of the rise of private responsibility in forestry and the adoption of a settled course of policy by the forest products industries. Although he makes no editorial comparisons, it will be borne in on the discerning reader that in general the stated policies of the forest industries, as exemplified by the Forest Industries Council, are more enlightened and more in the public interest than were the proposals of the stockmen's associations a few years ago with respect to the federal range.

Each of the twelve chapters concludes with a summary and analysis of all that has gone before and provides a most useful compendium of the current status of federal, state, and private forest policies and how they evolved.

Three useful appendixes are provided. The first is a survey of federal policy on wildlife, soil, water, and minerals. The second is a chronological summary of important events in the development of colonial and federal policies relating to natural resources. The third is an excellent selected bibliography.

Although intended primarily as a text and reference work for students of natural resource management, this book should be of special interest to technicians and professional workers, and indeed to readers in general. It is a worthy addition to McGraw-Hill's splendid American Forestry Series.

It would be an act of discourtesy for this reviewer to fail to mention the numerous instances in which Dana acknowledges the contributions of the Society of American Foresters to the development of forestry in the United States. "The striking advances in forest policy and forest practice that have occurred in the last half century," he writes, "are in large measure due to the insistence by that society on high standards of professional competence and ethical conduct."

Elsewhere he remarks that "Much of the progress that has taken place in forestry has been due to the leadership of professional foresters, both individually and collectively through the Society of American Foresters . . . Through the *Journal of Forestry* it has provided an effective medium for the presentation of information and the interchange of ideas, and through its geographical sections and its subject-matter divisions it has promoted friendly personal relationships and informal discussion of matters of common interest. It has been an integrating and stimulating agency with widespread influence on the country's forest policies and practices."

For those gracious compliments the Society is most grateful, and in behalf of all the members this reviewer thanks Dr. Dana for his kind words. May the book become a best seller!

HENRY CLEPPER

## Topsoil & Civilization

By Tom Dale and Vernon Gill Carter. 270 pp. Illus. University of Oklahoma Press, Norman, Okla. 1955. $3.95.

The authors of this book have been intimately associated with conservation movements since their college days. Tom Dale is now an information specialist with the Soil Conservation Service in Washington, D. C. Vernon Gill Carter is director of conservation education in the Zanesville, Ohio public schools. They have done an immense amount of reading on the subject of conservation and the abuse and use of natural resources. In a 25-page opening chapter they take an overall look at the use of resources through the ages to set the pattern for the remainder of their work.

They treat the major civilizations for which we have a record in separate chapters, beginning with the Nile Valley and continuing into Mesopotamia, the Eastern Mediterranean, the Greek, Roman, North African, and later cultures. In every one of these they make a strong point of the relationship between the decline of a culture and the soil and other natural resources which were the basis for the culture. They show quite clearly that as long as the productive capacity of the land remained high, civilization continued to progress in every area. When the productive capacity of the land was reduced, a commercial civilization developed to utilize the resources untapped in barbarian lands. As the dependence of the home country on its colonies increased they became increasingly susceptible to conquerors and other forces of decline.

They take into account the degree to which the life of a culture was increased by employing partial conservation measures, but in every instance where the disappearance of a civilization took place, the land base for it was already lost.

They point out that "regardless of the forces that stimulate cultural progress, both civilization and the enjoyment of civilization rest on a *surplus* production by those who supply the necessities of life. By surplus production, we mean a surplus above the actual needs of the primary producers. The primary producers must supply a surplus," and "the quantity and quality of these resources largely determine the amount of surplus produced."

In the case of civilizations which recovered from invasions and other catastrophies, the cities which were the centers of these civilizations were usually re-built when the soil and other resources that had made them possible in the first place remained undamaged.

The case they make is that the whole situation facing the world is not a hopeless one—that men have the opportunity to maintain a high standard of living, and that there are present or potentially available enough natural resources to provide all the people in the world with a better living *if* an all-inclusive conservation policy is adopted by the people—that present international responsibilities of leadership by the United States puts the burden for the adoption of a sound national conservation program right on the shoulders of the people of this country.

The general tone of the work is optimistic. It is "iffy" to the extent that people—all the people—must want to do something about maintaining their standard of living. Available resources plus improved technologists working under a program that people have come to believe is fundamental can preserve the things that human beings have striven for over the years. The forester's place in the scheme of conservation is a large one, but his is only one of several.

Richard M. May
*Soil Conservation Service*

## Publications of Interest

Of special interest to foresters and others interested in timber is an article which appeared in the November, 1955 issue of Taxes, a magazine devoted to tax problems and discussions.

On pages 824-839 of this magazine is an article entitled "Federal Timber Taxes Under The New Code," by Charles E. Bowen, a Miami Beach Tax Attorney. This article is a must for everyone at all concerned with timber taxes. Very well written, it summarizes neatly (and very completely) all phases of the timber tax problem. The author discusses basis, value, and cost in relation to timber property and explain the federal timber tax laws in detail. The article gives many specific examples and case histories all of which are well referenced with citations to court decisions and government regulations.

In the writers words, "A clearer understanding of income tax procedure in regard to timber should benefit all timber owners. The savings realized through use of correct procedures in reporting timber receipts and expenditures should act as an incentive for growing, protecting and utilizing the timber more wisely."

A copy of the November issue of the magazine can be obtained for the price of sixty cents from: TAXES, The Tax Magazine; Commerce Clearing House, Inc.; 214 North Michigan Avenue; Chicago 1, Ill.

Arnold F. Wallen
*Hammon, Jensen & Wallen*
*Oakland, Calif.*

## Register of Vegetation Research Issued

The Committee for Vegetation Study of the Ecological Society of America has recently issued a *Register of Vegetation Research*. Supplements to this first Register will be published as often as sufficient information is collected, probably at least once every two years. Questionnaires for such a supplement are currently being distributed. Anyone working in the indicated field is invited to fill out this questionnaire. In general, all projects concerned with the study of naturally occurring, macroscopic plant communities will be included. Research concerned entirely with artificial communities, applied work, life history studies of individual species, and work primarily concerned with the environment are excluded. Geographically, the Register includes only studies of North American vegetation.

Copies of the current Register, priced at $1, and questionnaire forms may be secured from Prof. Grant Cottam, Birge Hall, University of Wisconsin, Madison 6, Wis.

# Current Literature

*Compiled by* MARTHA MEELIG, *Librarian, State University of New York College of Forestry*
*Range Management Section Compiled by* FRANCES FLICK, *Library, U. S. Department of Agriculture*

### General

*Forest Genetics at the Institute of Paper Chemistry.* 20 pp. Illus. Institute of Paper Chemistry, Appleton, Wis. 1955.

*The Mysterious North.* By Pierre Berton. 384 pp. Illus. Alfred A. Knopf, New York. 1955. $5.00.

### Chemical Debarking

*Chemical Debarking of Some Pulpwood Species* by Hugh Wilcox, F. J. Czabator, G. Girolami, D. F. Moreland, and R. F. Smith with a Section on the Effect of Chemical Debarking on Forest Wildlife by W. L. Webb, E. M. Rosasco, and S. V. R. Simkins. 43 pp. Illus. State Univ. of New York College of Forestry, Syracuse 10. 1956. Tech. Publ. No. 77. 60 cents.

*Costs of Chemical Debarking Oak in Lower Michigan.* By P. C. Guilkey and R. W. Blair. 2 pp. Lake States Forest Expt. Sta., St. Paul 1, Minn. 1956. Tech. Notes No. 445. Mimeog.

### Farm Forestry

*Logging Farm Wood Crops.* By F. C. Simmons. 52 pp. Illus. U. S. Dept. of Agric., Washington 25, D. C. 1955. Farmers' Bul. No. 2090. (Supersedes Nos. 1907 and 2008) 20 cents (Govt. Print. Off.)

### Forest Economics

*Economics Research Needs Related to Wildland Management and Development in the Mountain States.* 27 pp. Illus. Intermountain Forest and Range Expt. Sta. Div. of Forest Econ., Ogden, Utah. 1956. Research Paper No. 38. Mimeog.

*Forest Ownership Stabilizing in Lake States.* By R. N. Cunningham. 2 pp. Lake States Forest Expt. Sta., St. Paul 1, Minn. 1956. Tech. Notes No. 448. Mimeog.

### Forest Management

*Better Diagnosis and Prescription in Southern Forest Management.* By L. R. Grosenbaugh. 27 pp. Southern Forest Expt. Sta., New Orleans. 1955. Occasional Paper No. 145. Mimeog.

*Control of Woody Weeds: Some Physiological Aspects.* By F. W. Woods. 50 pp. Southern Forest Expt. Sta., New Orleans. 1955. Occasional Paper Co. No. 143. Mimeog.

*Forest Management Lessons from a 1949 Windstorm in Northern Wisconsin and Upper Michigan.* By J. H. Stoeckler and Carl Arbogast, Jr. 11 pp. Lake States Forest Expt. Sta., St. Paul 1, Minn. 1955. Station Paper No. 34, Mimeog.

*Sugar Pine Management—An Annotated Bibliography.* By J. L. Averell, J. C. Crowell, C. R. Quick, and G. H. Schubert. 56 pp. California Forest and Range Expt. Sta., Berkeley. 1955. Tech. Paper No. 12. Mimeog.

### Forest Resources

*Forest Resources of the Buffalo Narrows—Beauval Area of Saskatchewan.* 36 pp. Illus. Province of Saskatchewan Dept. of Natural Resources Forestry Bureau. 1956. Forest Inventory Ser. Rept. No. 5.

*Forest Statistics for the North-Central Section of Pennsylvania.* 16 pp. Northeastern Forest Expt. Sta., Upper Darby, Penna. 1956. Forest Statistics Ser. Pennsylvania No. 4. Mimeog.

*Forest Statistics for the Southwestern Section of Pennsylvania.* 16 pp. Northeastern Forest Expt. Sta., Upper Darby, Penna. 1956. Forest Statistics Ser. Pennsylvania No. 6. Mimeog.

*Forest Statistics for Thurston Co., Washington.* By M. P. Twerdal and Don Minore. 27 pp. Pacific Northwest Forest and Range Expt. Sta., Portland, Ore. 1955. Forest Survey Rept. No. 123. Mimeog.

### Protection

*The Forest Insect Situation, Lake States 1955.* By L. C. Beckwith and H. G. Ewan. 15 pp. Lake States Forest Expt. Sta., St. Paul 1, Minn. 1956. Sta. Paper No. 35. Mimeog.

*Insects of Wisconsin Forests.* By R. D. Shenefelt and D. M. Benjamin. 110 pp. Illus. Univ. of Wisconsin Expt. Sta. 1955. Cir. No. 500.

### Range Management

*Burning and Grazing on Glade Range in Missouri.* By S. C. Martin and J. S. Crosby. 13 pp. Illus. U. S. Forest Serv. Central States Forest Expt. Sta., Columbus, Ohio. Sept. 1955. Tech. Paper No. 147.

*The California Deserts.* Ed. 3. By E. C. Jaeger and others. 211 pp. Illus. Stanford Univ. Press, Stanford, Calif. 1955. $5.00.

*Digestibility of Range Grasses and Grass-Legume Mixtures.* By W. E. Watkins. 21 pp. Illus. New Mexico Agric. Expt. Sta., State College. July 1955. Bul. No. 400.

*Grass for Conservation in the Southern Great Plains.* By B. W. Allred and W. M. Nixon. 30 pp. Illus. Supt. of Documents, U. S. Govt. Print Off., Washington 25, D. C. U. S. Dept. of Agric. Farmers' Bul. No. 2093. Dec. 1955. 15 cents.

### Silviculture

*An Allowance for Bark Increment in Computing Tree Diameter Growth for Southeastern Species.* By J. F. McCormack. 6 pp. Southeastern Forest Expt. Sta., Asheville, N. C. 1955. Sta. Paper No. 60.

*The Effect of Various Slash Disposal Methods on the Regeneration of Cut-over Jack Pine Stands.* By H. L. Johnson. 11 pp. Canada Forestry Branch, Ottawa. 1955. Tech. Note No. 23.

*Growing Loblolly Pine in the South Atlantic States.* By Thomas Lotti. 33 pp. Illus. U. S. Dept. of Agric., Washington 25, D. C. 1956. Farmers' Bul. No. 2097. 15 cents (Govt. Print. Off.)

*How to Control the Pollination of Slash and Longleaf Pine.* By François Mergen, Harry Rossoll, and K. B. Pomeroy. 14 pp. Illus. Southeastern Forest Expt. Sta., Asheville, N. C. 1955. Sta. Paper No. 58.

*Lodgepole Pine Studies at the Strachan Experimental Block in Atlanta.* By D. I. Crossley. 13 pp. Illus. Canada Forestry Branch, Ottawa. 1955. Tech. Note No. 19.

*Mechanical Sacrification to Induce White Spruce Regeneration in Old Cut-Over Spruce Stands.* By D. I. Crossley. 13 pp. Illus. Canada Forestry Branch, Ottawa. 1955. Tech. Note No. 24.

*The Production and Dispersal of Lodgepole Pine Seed.* By D. I. Crossley. 12 pp. Illus. Canada Forestry Branch, Ottawa. 1955. Tech. Note No. 25.

### Soils

*Soil-Moisture Measurement.* By H. W. Lull and K. G. Reinhart. 56 pp. Southern Forest Expt. Sta., New Orleans. 1955. Occasional Paper No. 140. Mimeog.

### Tree Farms

*This is Tree Farming.* 14 pp. Illus. American Forest Products Industries, Washington 6, D. C.

*The Trees That Are Marked for Market.* (Comic book about tree farming.) By Edward F. Howard Corp. 15 pp. International Paper Co., Southern Kraft Div., Mobile, Ala. 1955.

### Wood Technology and Utilization

*Hardwood Pulp; Its Manufacture and Use with Special Reference to Southern New England.* By H. B. Shepard. 67, XV pp. The New England Council, Boston 16. 1956. $2.00.

*Raised, Loosened, Torn, Chipped and Fuzzy Grain in Lumber.* 9 pp. Illus. U. S. Forest Products Laboratory, Madison 5, Wis. 1955. Rept. No. 2044.

*Resin Distribution in Second-Growth Ponderosa Pine.* By B. H. Paul. 4 pp. U. S. Forest Products Laboratory, Madison 5, Wis. 1955. Rept. No. 2046. Mimeog.

*Variations in Fiber Length of Eastern Cottonwood.* By Margaret Kaeiser. 5 pp. U. S. Forest Products Laboratory, Madison 5, Wis. 1956. Rept. No. 2047.

# Society Affairs

## Officers and Council
## 1956-1957

DEWITT NELSON, *President*
Department of Natural Resources
315 State Office Building 1
Sacramento 14, Calif.

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Union Bag & Paper Corporation
P. O. Box 570
Savannah, Ga.

PHILIP A. BRIEGLEB
Southern Forest Experiment Station
704 Lowich Building
2026 St. Charles Avenue
New Orleans 13, La.

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Florida Forest Service
Tallahassee, Fla.

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Tacoma 1, Wash.

HENRY CLEPPER, *Executive Secretary*
Mills Building, 17th Street at Pennsylvania Avenue, N.W.
Washington 6, D. C.

JOSEPH S. ILLICK
College of Forestry
State University of New York
Syracuse 10, N. Y.

J. HERBERT STONE
U. S. Forest Service
729 N.E. Oregon St.
Portland 8, Ore.

HENRY J. VAUX
School of Forestry
University of California
Berkeley 4, Calif.

THIS GROUP met in Memphis, March 5, to start planning for the S.A.F. annual meeting in that city's Peabody Hotel, October 14-17.

Seated left to right: Mrs. W. Jeter Eason, chairman, ladies hospitality and entertainment; George C. Romeiser, chairman, arrangements committee; Jean W. Murphy, secretary to Russell Stadelman; Henry Clepper, S.A.F. executive secretary; Russell Stadelman, general chairman; J. O. Artman, chairman, information and publicity committee.

Standing left to right: Douglas E. Berlin, projection and amplifying equipment chairman; Robert P. Burton, Jr., chairman, hotel reservations committee; John A. Putnam, chairman, field trip committee; William W. May, chairman, exhibits committee; Wharton Z. Hawkins, vice chairman, arrangements committee; Philip A. Briegleb, chairman, program committee; C. F. Grafton, chairman, annual dinner committee; John W. Lehman, chairman, registration and welcome; William T. Hawkins, representing A. K. Dexter, chairman, "Beale Street night" committee.

# Colleges and Universities in the United States Offering Instruction in Forestry (May 1, 1956)

## Accredited

**The following institutions are accredited for forestry instruction by the Council of the Society of American Foresters.**

Alabama Polytechnic Institute, Department of Forestry, Auburn, Ala.

University of California, School of Forestry, Berkeley 4, Calif.

Colorado A & M College, School of Forestry and Range Management, Fort Collins, Colo.

Duke University, School of Forestry, Durham, N. C.

University of Florida, School of Forestry, Gainesville, Fla.

University of Georgia, School of Forestry, Athens, Ga.

University of Idaho, College of Forestry, Moscow, Idaho.

Iowa State College, Department of Forestry, Ames, Iowa.

Louisiana Polytechnic Institute, Department of Forestry, Ruston, La.

Louisiana State University, School of Forestry, Baton Rouge 3, La.

University of Maine, Department of Forestry, Orono, Maine.

University of Massachusetts, Department of Forestry and Wildlife Management, Amherst, Mass.

Michigan State University, Division of Conservation, East Lansing, Mich.

University of Michigan, School of Natural Resources, Ann Arbor, Mich.

University of Minnesota, School of Forestry, St. Paul 1, Minn.

University of Missouri, Department of Forestry, Columbia, Mo.

Montana State University, School of Forestry, Missoula, Mont.

State University of New York, College of Forestry, Syracuse 10, N. Y.

North Carolina State College, School of Forestry, Raleigh, N. C.

Oregon State College, School of Forestry, Corvallis, Ore.

Pennsylvania State University, School of Forestry, University Park, Pa.

Purdue University, Department of Forestry, Lafayette, Ind.

Utah State Agricultural College, School of Forestry, Range and Wildlife Management, Logan, Utah.

University of Washington, College of Forestry, Seattle 5, Wash.

West Virginia University, Division of Forestry, Morgantown, W. Va.

Yale University, School of Forestry, New Haven 11, Conn.

## Not Accredited

**The following institutions offer professional and/or technical curricula in forestry, but do not meet the requirements for accreditation.**

Arkansas Agricultural and Mechanical College, Department of Forestry, College Heights, Ark.

Stephen F. Austin State College, Department of Forestry, Nacogdoches, Texas.

University of Connecticut, Department of Forestry and Wildlife Management, Storrs, Conn.

Harvard University, Harvard Forest, Petersham, Mass.

Michigan College of Mining and Technology, Department of Forestry, Houghton, Mich.

Mississippi State College, Department of Forestry, State College, Miss.

University of New Hampshire, Department of Forestry, Durham, N. H.

Oklahoma Agricultural and Mechanical College, Department of Forestry, Stillwater, Okla.

University of the South, Forestry Department, Sewanee, Tenn.

Virginia Polytechnic Institute, Department of Biology, Blacksburg, Va.

State College of Washington, Department of Forestry and Range Management, Pullman, Wash.

## Introductory, Preforestry, and Specialized Courses

Abraham Baldwin Agricultural College, Tifton, Ga.

University of Arkansas, Department of Horticulture, Fayetteville, Ark.

Centenary College of Louisiana, Department of Biology, Shreveport, La.

Clemson Agricultural College, School of Agriculture, Clemson, S. C.

Cornell University, Department of Conservation, Ithaca, N. Y.

Grand Rapids Junior College, Grand Rapids, Mich.

Humboldt State College, Forestry Department, Arcata, Calif.

Idaho State College, Pocatello, Idaho.

University of Illinois, Department of Forestry, Urbana, Ill.

University of Kentucky, Department of Horticulture, Lexington, Ky.

Lassen Junior College, Division of Vocational Forestry and Lumbering, Susanville, Calif.

University of Maryland, Department of Horticulture, College Park, Md.

McNeese State College, Department of Agriculture, Lake Charles, La.

North Dakota Agricultural College, Department of Horticulture and Forestry, Fargo, N. Dak.

North Dakota School of Forestry, Bottineau, N. Dak.

Northwestern State College, Agriculture Department, Natchitoches, La.

Ohio State University, Department of Horticulture and Forestry, Columbus 10, Ohio.

Paul Smith's College, Forestry Department, Paul Smiths, N. Y.

Pasadena City College, Pasadena 4, Calif.

Rutgers University, Department of Forestry, New Brunswick, N. J.

Southern Illinois University, Division of Rural Studies, Carbondale, Ill.

University of Tennessee, Department of Horticulture and Forestry, Knoxville 16, Tenn.

Texas A & M College, Department of Range and Forestry, College Station, Texas.

University of Vermont, College of Agriculture, Burlington, Vt.

University of Virginia, School of Forestry, Charlottesville, Va.

Wisconsin State College, Botany Department, Superior, Wis.

University of Wisconsin, College of Agriculture, Madison, Wis.

## Ranger Schools

State Forest Ranger School of the University of Florida, Lake City, Fla.

State Ranger School of State University College of Forestry, Wanakena, N. Y.

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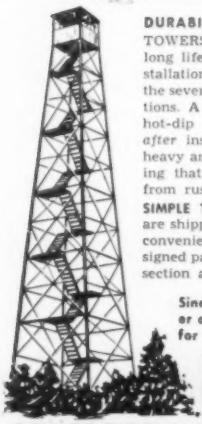

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## The President's Column

DEWITT NELSON

I am reminded of the plaint of my contemporaries that the trails are steeper than they used to be, the axes are heavier, and with each succeeding directory the telephone company uses smaller type. For me this problem has taken a new twist. The months are getting shorter. This could be due to the regularity with which the editor reminds me that this column is due.

In presenting these columns I hope to establish some continuity of thought and advance some ideas which may stimulate others to dig a little deeper here and there. If they do not reach this objective they have at least disciplined the thinking of the author.

In the February issue I discussed opportunities and responsibilities in the field of forestry and water. Last month I digressed to discuss the Council meeting.

In this column I would like to explore professional opportunities for the young foresters and forestry students. Forest administration covers a broad area extending from fire control to management plans and operations. Research reaches from silviculture to chemistry and physics. Specializations encompass a multitude of activities from recreation to insect and disease control.

Pinchot, Graves, Greeley and many others pioneered forestry principles, ideas, methods, and techniques to meet the problems of their day. They laid the foundation for forestry as a science and a profession.

Today's young men have need of the same pioneer spirit which motivated the old timers. The problems are different but the horizons are just as broad and they stretch out in every direction. We need men who will dare to dig deeply into new and untried fields. We need to embrace the opportunities which professional prestige has given us.

Today's concept is to more effectively blend the theoretical with the practical and to integrate the using industries with the science of land use and timber production. More and more the laws of economics are playing a leading role in sound forestry. There is an ever growing number of owners and operators searching for and applying new principles of management and utilization as rapidly as the economics of their industries can absorb them. While these gains are being made within the limits of prudence and vision, the scientist must look to distant horizons. We must learn to realize the greatest potential from our soils and climates through the use of scientific aids and management skills.

The science of chemistry is opening new opportunities in the woods as well as in the manufacturing plant. Chemistry will be a silvicultural tool in controlling competition from undesirable species, and aid in combating insects, disease, and fire. We must explore the possibilities of biological controls of forest and range pests. We must seek better ways of integrating the production from many small mills in order to secure better utilization of valuable raw materials. These are among today's frontiers. They are the uncertain and undeveloped regions in the field of forestry. They will provide the opportunities for the young men who have chosen forestry as a career.

These young men will inherit the responsibility for maintaining the productive capacity of our forest lands, for the production of wood and wood fiber is becoming more important each year. We are told that during the past ten years the paper industry has doubled its productive capacity and that it expects to double its present capacity in the next twenty years. I am confident that the demand for good lumber, veneer, and similar wood products will continue at a high level with our growing population.

I recently had the privilege of speaking to the Forestry Club at the University of California. Like their counterparts in the other schools their questions were mainly of the future—their future and their opportunities. Although a goodly percentage of the eligible students in our 26 accredited schools become Student Members of the Society, a certain proportion do not. Do forestry students realize the value of affiliation with their professional society as a preparation for that future? Do we of the Society realize the importance of meeting with these students whenever the opportunity presents itself? Do the local Chapters and the Sections give the students the

lift of recognition that they should? Remember, they are tomorrow's foresters.

*DeWitt Nelson*

## Coming Events

### Northeastern Forest Tree Improvement Conference

A two-day summer meeting of the Fourth Northeastern Forest Tree Improvement Conference will be held at Johnsonburg, Pa., on August 7 and 8. Meetings will be held in the field and will center around discussions of the application of genetic concepts and methods to timber management.

Ernst J. Schreiner, c/o Morris Arboretum, Philadelphia 18, Pa., is executive secretary of the conference.

### Canadian Forestry Association

The Canadian Forestry Association will hold a National Forestry Conference in Winnipeg, Ontario, Canada, September 17-19, 1956.

### Gulf States Section Meeting

The Gulf States Section will hold its annual meeting at the Hotel Beaumont, Beaumont, Texas, on May 10-11, 1956.

## Plans Under Way for Society of American Foresters 56th Annual Meeting

"Forestry Faces Forward" is the theme of the 56th annual meeting to be held in Memphis, Tennessee, October 14-17, 1956, in the Peabody Hotel.

The first general session will be opened by President DeWitt Nelson on Monday morning, October 15.

Meetings of the Society's 11 subject Divisions will be held on Tuesday and Wednesday, October 16 and 17. Tuesday evening will be devoted to social activities centered around "A Night on Beale Street." The Society's annual dinner will be served Wednesday evening, during which there will be presentations of the Gifford Pinchot Medal and the Sir William Schlich Memorial Medal.

Russell Stadelman, general chairman of the meeting, and George Romeiser, chairman of arrangements, are making plans for an attendance of 1,200 Society members and guests. Special events are being planned for the ladies.

The program committee is headed by P. A. Briegleb. Details of the program, including topics and speakers, will be reported in subsequent issues of the JOURNAL. Information about hotels and room reservations will also appear in an early issue.

## Forest Science Successfully Launched

*Forest Science* is now in its second year as a quarterly journal of research and technical developments. As the first new nation-wide American forestry journal since 1905, *Forest Science* is international in content and in appeal, being devoted to articles and reviews of primary interest to scientists, educators, and specialists.

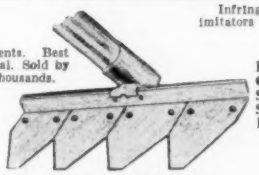
The need for the new enterprise has been demonstrated by its first-year's history. Over 900 pre-appearance subscriptions were received and more than 1,200 had subscribed by the end of 1955. Volume One contained 42 articles on 356 pages.

*Forest Science* is edited by Stephen H. Spurr, professor of silviculture, University of Michigan; V. L. Harper, assistant chief for research, U. S. Forest Service; and Henry Clepper, executive secretary, Society of American Foresters.

Subscriptions at $6 a year can be placed with Forest Science, 425 Mills Building, Washington 6, D. C.

## Membership Applications and Advancements

Proposals for admission, advancement, and reinstatements received in the Society office during the month of March are listed below. Action on the eligibility of those proposed for membership as listed below will be taken by the Council as of June 1, 1956. Communications from voting members regarding the membership eligibility of these persons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should be received in the Society office prior to that date.

### Allegheny Section

*Student Grade*

PENNSYLVANIA STATE UNIVERSITY

Anundson, D. E. Kaminski, J. S.
Caton, P. E. Primozic, F. R.
Duhnkrack, A. R. Wallace, R. G.
Frank, R. L.

*Junior Grade*

Levitan, J. S., Grad. Student, Pa. State University Park, Pa.; Pa. State, B.S.F., 1955.
Owens, J. L., Soil Scientist, Soil Cons. Service, Harrisburg, Pa.; Pa. State, B.S.F., 1950.
Sheldon, N. K., Forester, U.S.F.S., Sheffield, Pa.; Univ. of Mass. B.S.F., 1955.

*Students Eligible for Automatic Advancement*

PENNSYLVANIA STATE UNIVERSITY

Augsburger, G. W. Welch, R. L.
Post, P. W.

WEST VIRGINIA UNIVERSITY

LaRue, G. M. Scott, B. T.

*Member Grade*

Porcella, S., 16 Holly St., Cranford, N. J. (Junior, 43R55).

### Appalachian Section

*Student Grade*

DUKE UNIVERSITY

Lewis, G. D.

*Junior Grade*

Van Surdam, J. A., Forester, U.S.F.S., Moncks Corner, S. C.; State Univ. of N. Y., B.S.F., 1955.
Wessell, J. C., Service Forester, Dept. of Cons. & Dev., Whiteville, N. C.; N. C. State, B.S.F., 1953.

*Students Eligible for Automatic Advancement*

NORTH CAROLINA STATE COLLEGE

Barr, B. D. Swift, J. G.
Rayburn, E. J.

*Member Grade*

Cole, W. H., Dist. Forest Ranger, U.S.F.S., Buena Vista, Va.; Univ. of Mich., B.S.F., 1924. (Junior, 1950).

*Affiliate Grade*

Smallwood, H. L., Supt., Champion Paper & Fibre Co., Newberry, S. C.

### Central States Section

*Junior Grade*

Hunter, C. K., City Forester, City of Geneva, Geneva, Ill.; Purdue Univ., B.S.F., 1949.

*Students Eligible for Automatic Advancement*

PURDUE UNIVERSITY

DenUyl, D. Stetzel, D.
Pryor, J. P.

### Columbia River Section

*Student Grade*

OREGON STATE COLLEGE

Gehrke, F. E. Liddicoatt, G. W.

*Junior Grade*

Horn, R. W., Manager, Menasha Plywood Corp., North Bend, Ore.; Ore. State, B.S.F., 1932.
Keeling, K. H., Forester, Heppner Pine Mills Inc., Heppner, Ore. Reinstatement.

*Affiliate Grade*

Hales, F. J., County Forester, Coos County, Coquille, Ore.
Lawrence, M. E., Forester & Rge. Mgr., Bur. of Land Mgmt., Medford, Ore.
Warnock, R. C., Forester, Bur. of Land Mgmt., Medford, Ore.

### Gulf States Section

*Student Grade*

LOUISIANA STATE UNIVERSITY

Foster, G. W. Watt, R. M.
Saucier, J. R.

*Junior Grade*

Waller, D. B., Regional Forester, Champion Paper & Fibre Co., Conroe, Texas; Stephen F. Austin State College, B.S., (Forestry), 1948. (Affiliate, 1951).

*Students Eligible for Automatic Advancement*

LOUISIANA POLYTECHNIC INSTITUTE

Joffrion, L. E. Nattin, J. H.
McCasland, R. K. Reese, J. B.

*Affiliate Grade*

Hutchinson, O. B., 907 Church St., Beaumont, Texas; Stephen F. Austin State College, B.S., (Forestry), 1955.

### Inland Empire Section

*Junior Grade*

*Students Eligible for Automatic Advancement*

UNIVERSITY OF IDAHO

Hoioos, R. R.

*Member Grade*

Dalke, P. D., Biologist Univ. of Idaho, Moscow, Idaho. Reinstatement.

*Affiliate Grade*

Montgomery, D. C., Forester, U.S.F.S., Elk City, Idaho; State College of Wash., B.S., (Forestry), 1949.

### Kentucky-Tennessee Section

*Junior Grade*

Gross, H. L., Forester, U.S.F.S., Tellico Plains, Tenn., Pa., State B.S.F., 1952.

*Affiliate Grade*

Holmes, B. A., Forester, U.S.F.S., Benton, Tenn.; Univ. of N. H., B.S., (Forestry), 1953.

### New England Section

*Student Grade*

YALE UNIVERSITY

Fowler, D. P.

*Junior Grade*

*Students Eligible for Automatic Advancement*

UNIVERSITY OF MAINE

Benger, A. D. Stockbridge, J. T.
Lester, D. T. Walker, J. D.
Mawson, J. C. Zai, L. E.

UNIVERSITY OF MASSACHUSETTS

MacNeill, R. L. Natale, P. R.

*Affiliate Grade*

Camp, R. F., Asst. Forester, Great Mountain Forest, Norfolk, Conn.; Univ. of Conn., B.S., (Forestry), 1955.

### New York Section

*Student Grade*

STATE UNIVERSITY OF NEW YORK

Blessing, H. O. Duffy, J. P.

*Students Eligible for Automatic Advancement*

STATE UNIVERSITY OF NEW YORK

Hanlon, L. F.

*Affiliate Grade*

Bird, I. D., Plant Forester, Ontario Paper Co., Ltd., Heron Bay South Ontario, Canada; Univ. of N. B., B.S., (Forestry), 1952.

### Northern California Section

*Student Grade*

UNIVERSITY OF CALIFORNIA

Cooper, G. D. Knauf, W. L.
Foster, H. B. Larson, L. J.
Hosler, D. E.

*Junior Grade*

Soares, G. A., Forester, Crane Mills, Inc., Flournoy, Calif. Reinstatement.
Wood, W. C., Forester, Diamond Match Co., Stirling City, Calif.; Iowa State, B.S.F., 1952.

*Students Eligible for Automatic Advancement*

UNIVERSITY OF CALIFORNIA

Lowell, P. G.

*Affiliate Grade*

Lindley, C. E., Ranger, Calif. Div. of Forestry, Hanford, Calif.

### Northern Rocky Mountain Section

*Junior Grade*

Gorsuch, H. L., Asst. Ranger, U.S.F.S., Lolo, Mont. Reinstatement.

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*Students Eligible for Automatic Advancement*

UNIVERSITY OF MISSOURI

Grey, G. W. Rapp, R. D.
Lowery, J. W. Sackett, A. H.
Massengale, R. A. Wilson, J. E.

*Member Grade*

Elliott, B. F., Dist. Ranger, U.S.F.S., Ava, Mo. (Junior, 36R55).

Heczko, C. G., Forester, U.S.F.S., Danville, Ark. (Junior, 1948).

Jackson, J. A., Asst. Supv., U.S.F.S., Rolla, Mo. (Junior, 1948).

Paulsell, L. K., Forester, Univ. of Mo., Univ. Forest, Williamsville, Mo.; Univ. of Mo., B.S.F., 1949; M.F., 1950. (Junior, 1951).

Pomeroy, L. K., President, Ozark Badger Lumber Co., Monticello, Ark. (Junior, 1949).

Russell, T. E., Research Forester, Southern Forest Expt. Sta., Heavener, Okla. (Junior, 1949).

Slankaukas, A. F., Forester, U.S.F.S., Hot Springs, Ark. (Junior, 1949).

Webb, R. N., Asst. Dist. Forester, Crossett Forestry Div., Crossett, Ark. (Junior, 1949).

**Puget Sound Section**

*Junior Grade*

Eliason, H. H., Sec.-Treas., Preston Logging Co., Arlington, Wash.; Univ. of Wash., B.S.F., 1953.

Schinnell, D. F., Logging Eng., St. Regis Paper Co., Mineral, Wash.; Univ. of Wash., B.S.F., 1950.

Smith, L. H., Log Scaler, Puget Sound Log Scaling & Grading Bur., Everett, Wash.; Univ. of Wash., B.S.F., 1949.

*Students Eligible for Automatic Advancement*

UNIVERSITY OF WASHINGTON

Cohen, L. I. Spangler, W. E.

*Member Grade*

England, R. F., 5717 E. 61st St., Seattle 5, Wash. (Junior, 1949).

Hauberg, J. H., 537 Skinner Bldg., Seattle, Wash. (Junior, 1949).

McGregor, R. C., Forester, Alaska Forest Research Center, Juneau, Alaska; Univ. of Mich., B.S.F., 1951; Yale, M.F., 1952. (Junior, 1951).

*Affiliate Grade*

Eide, R. P., Nurseryman, Forest Industries Tree Nursery, Nisqually, Wash.

Lake, F. M., Forest Eng., Peshastin Lbr. & Box, Inc., Peshastin, Wash.

**Southeastern Section**

*Junior Grade*

Frese, R. B., 103 Fairview Dr., Demopolis, Ala. Reinstatement.

Griffin, E. C., 3404 Rosemary St., Jacksonville, Fla. Reinstatement.

Jeffries, A. R., Forester, Union Bag & Paper Co., Savannah, Ga.; Duke Univ., M.F., 1955. (Affiliate, 1953).

Parker, J. A., Forest Supt., Brunswick Pulp & Paper Co., Waycross, Ga.; Duke Univ., M.F., 1951.

Snelling, J. D., Forester, Reynolds & Manley Lbr. Co., Savannah, Ga.; Univ. of Ga., B.S.F., 1942.

Stewart, D. L., Asst. Dist. Forester, Ga. Forestry Comm., Newnan, Ga.; Univ. of Ga., B.S.F., 1950.

*Students Eligible for Automatic Advancement*

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Cathcart, J. R.

UNIVERSITY OF GEORGIA

Rogers, W. G.

*Affiliate Grade*

Abernathy, J. R., Forest Mgr., W. A. Belcher Lbr. Co., Birmingham, Ala.

**Southwestern Section**

*Member Grade*

Collins, M. C., Asst. Area Forester, Bur. of Indian Affairs, Gallup, N. Mex.; Univ. of Calif., B.S.F., 1926. Reinstatement.

**Upper-Mississippi Valley Section**

*Student Grade*

IOWA STATE COLLEGE

Groom, W. J. Vogt, W. M.

UNIVERSITY OF MINNESOTA

Sandberg, G. W.

*Junior Grade*

Elo, A., 304 Second Ave., N.W., Chisholm, Minn. Reinstatement.

Johnson, G. T., Forester, Northwest Paper Co., Ely, Minn.; Mich. State, B.S.F., 1950.

*Students Eligible for Automatic Advancement*

IOWA STATE COLLEGE

Gore, J. L. Gruening, W. E.

*Member Grade*

Ferguson, D. H., Dist. Forest Ranger, U.S.F.S., Two Harbors, Minn. Reinstatement.

**Washington Section**

*Junior Grade*

Clapp, V. W., 231 Miss. Ave., S.E., Wash., D. C.; State Univ. of N. Y., B.S.F., 1955.

*Associate Grade*

Hornaday, F. E., Executive Vice Pres., American Forestry Asso., Wash., D. C. Reinstatement.

**Wisconsin-Michigan Section**

*Student Grade*

UNIVERSITY OF MICHIGAN

Trefts, H.

*Junior Grade*

Leo, G. N., Supv., Consumers Power Co., Jackson, Mich. Reinstatement.

Ramsey, R. A., Forester, Bur. of Indian Affairs, Shawano, Wis.; Iowa State, B.S.F., 1950.

*Students Eligible for Automatic Advancement*

MICHIGAN STATE UNIVERSITY

Gould, R. J. Moser, F. R.
Hoyer, R. C. Rodgers, G. W.
Kutchera, G. E. Stein, C. P.
Marlega, R. R. Wedding, J. R.
Marx, R. P. Wildenberg, R. J.
McSloy, J. H.

UNIVERSITY OF MICHIGAN

Beard, P. O. Kuehl, T. R.
Brock, S. M. Whitmore, F. W.

*Affiliate Grade*

Genys, J. B., Research Forester, U.S.F.S., Rhinelander, Wis.; Univ. of Gottingen, B.S., (Forestry), 1949.

**Foreign**

*Affiliate Grade*

Teeguarden, D. E., U.S.S. Oriskany, F.P.O., San Francisco, Calif.; Mich. College of Mining & Tech., B.S., (Forest Prod.), 1953.

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# Forestry News

## President's Cabinet Committee Reports on Water Policy

The President's Cabinet Committee on Water Resources Policy has been sent by Mr. Eisenhower to the Congress with the President's personal endorsement of its "purposes and objectives." He accepts and recommends to the Congress the framework of policies which will permit the federal government, the state and local governments, and other non-federal interests to cooperate in developing water resources. "These policies," the President says, "will reconcile many practices among Federal agencies that are now in conflict."

The Presidential Advisory Committee, of which Interior Secretary McKay was chairman, proposed that interests which benefit from federal water development projects share the cost in proportion to benefits received. The federal government would pay for benefits held to be national and widespread. In most instances, the committee said, this would mean that direct identifiable beneficiaries would pay a greater share of the cost than they do now.

Another major recommendation was that the new post of Coordinator of Water Resources be set up in the executive offices of the President, and that a Board of Review be established, independent of other federal agencies, to analyze the engineering and economic feasibility of water development projects. The board would report to the President, through the Coordinator. The Budget Bureau, which would be relieved of the feasibility review, would still have the task of fitting approved development plans into the nation's financial plans.

The 35-page printed report brings out that, in general, the organizational changes would be designed to establish a unified government approach toward water development no matter which federal agency carried out a project. The cost sharing would affect principally multi-purpose dams and the allocation of costs among such features as flood control, navigation, irrigation, soil conservation, and power production. The report agrees with a Hoover Commission recommendation that serious consideration be given to the collection of user charges to repay a portion of the costs of new navigation projects.

Additional recommendations of the Cabinet group include regional or river basin committees and a permanent federal inter-agency committee. Regional committees would be composed of representatives of all federal departments involved and the states concerned, with a chairman appointed by the President. The inter-agency committee would be composed of the principal policymaking officials of the agencies concerned, under the chairmanship of the Coordinator, and would be advisory in character.

It was pointed out that this report is the first in which all departments of the federal government concerned with water resources development have agreed on major policy matters.

## 21st North American Wildlife Conference

Approximately 1,000 persons attended the 21st North American Wildlife Conference, held March 5-7 in the Jung Hotel of New Orleans, La., according to the Wildlife Management


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Institute, sponsor of this large annual meeting.

The theme of this year's conference was "Pulling Together for Conservation." Dr. Oliver S. Willham, president, Oklahoma A. & M. College, presided as chairman of the opening general session, assisted by Paul A. Herbert, director, Division of Conservation, Michigan State University.

William J. McGlothlin, associate director for regional programs, Southern Regional Educational Board, was chairman of the second general session, which discussed "How To Get Coordination in Conservation."

"International Teamwork in Waterfowl Management," the subject of the closing general session on the final day of the conference, prompted widespread interest. Harry D. Ruhl, chief of the division of game, Michigan Department of Conservation was session chairman.

Six technical sessions devoted to specific problems in all phases of renewable natural resources management were conducted. I. T. Bode, director, Missouri Conservation Commission, presented an appraisal of the general and technical sessions of the Conference and commented on significant trends and probable developments.

Printed transactions of the Conference will be available upon publication at cost from the Wildlife Management Institute, Washington, D. C.

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## Kenneth B. Pomeroy, Forest Service Research Specialist, Named Chief Forester of the American Forestry Association

Kenneth B. Pomeroy, forest management research specialist in the U.S. Forest Service, has been appointed chief forester of The American Forestry Association effective July 1. He succeeds Lowell Besley who has accepted a position with the Pulp and Paper Research Institute in Canada.

Mr. Pomeroy, presently chief of forest management at the Northeastern Forest Experiment Station at Upper Darby, Pennsylvania, has a 23-year background of research and administrative experience in the Forest Service. Prior to moving to Pennsylvania early this year he served for five years as leader of the Lake City, Florida, Research Center of the Southeastern Forest Experiment Station.

Prior to Forest Service employment, Mr. Pomeroy served as agricultural representative of the DuPont Com pany. He was graduated from Michigan State University with a forestry degree in 1928 and obtained his master's degree at Duke University in 1948.

Members of The American Forestry Association had their first opportunity to meet Mr. Pomeroy personally at their annual meeting in Jacksonville, Florida, last fall. Mr. Pomeroy served as program chairman for this meeting and had charge of forestry tours that included a visit to the Lake City Research Center.

A member of the Society of American Foresters, Mr. Pomeroy was chairman of the Southeastern Section in 1954.

### Forester Appointed to German Embassy

The Federal Republic of Germany has recently appointed a Forestry Secretary to its embassy in Washington. He is Wolfgang Koehler and the only forester of such diplomatic rank assigned in Washington. The United States as yet has no forestry attaches abroad. Koehler is probably known to many members of the U.S. Forest Service since he served for several years as Forstmeister to the Forstamt Rosengarten near Hamburg (State of Lower Saxony) and also worked for 10 years in several offices of Forest Administration in Germany. In 1953 he was a member of a German Study Group that spent two months in the United States under a Technical Assistance program and visited some of the national forests.

"The appointment of a Forestry Secretary to the German Embassy in Washington," says Albert F. Ernecke, commercial counselor at the Embassy, "proves the increasing understanding of the important and useful role that forest and timber activities play in the national economy. The knowledge and exchange of experience and of the results of research among the nations leading in the field of forestry would help to improve the world's timber resources and serve international cooperation in forestry."

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"We applied SUNOX in a test for control of pre-emergence damping-off on both black and white spruce. Damping-off killed 75% of the seedlings in the control bed, 50% in the recommended treatment and less than 10% in double the recommended measure," reported a large grower in the Mid-west.

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## Private & Industrial

### Consulting Foresters Elect Officers

At the annual meeting of the Association of Consulting Foresters held in Columbus, Ohio, Mr. J. Atwood Whitman of Glendon, North Carolina was elected president for a two year term of office. Other officers elected were: William J. Bozett, Logan, Ohio, vice president; Keith Cranston, Leland, Mississippi, secretary-treasurer. T. M. Howerton, Jr. of Madison, Florida, past president, was elected to the executive board. Seymour I. Somberg, Miami, Florida, was appointed as editor of *The Consultant*, the official organ of the Association. Mr. Somberg was also appointed as executive secretary.

The Association of Consulting Foresters was established in 1948 and its membership is limited to full time forestry consultants. The address of the Association is: 415 Olympia Building, Miami 32, Florida.

### Big Game Harvest on Crown Zellerbach Tree Farms in Pacific Northwest

Some 1,600 big game animals were harvested by sportsmen on the Washington and Oregon tree farms of Crown Zellerbach Corporation during the 1955 hunting season. About 635,000 acres of forest land are involved. The breakdown of game kill by species on nine company-owned tracts is contained in a summary released by E. P. Stamm, Portland, vice president in charge of Northwest timber operations.

The game take represents about 14,000 hunter-use days. Animals taken included 1,324 deer, 297 elk, 61 bear—a slightly lower harvest than the 1954 season in which 1,531 deer, 899 elk, 52 bear, 21 coyotes, and 4 bobcats were taken. Poor hunting weather and fewer hunters are possible reasons for the smaller 1955 harvest.

The 130,000-acre Clatsop Tree Farm south of Astoria, Oregon produced the

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largest number of animals. An estimated 5,000 hunters vied for the game bag here which totalled 300 deer, 290 elk, and 10 bear. Next in line was the 106,000-acre Cathlamet Tree Farm in Wahkiakum County, Washington, where approximately 2,000 hunters took 350 deer, 94 elk, and 15 bear.

Crown Zellerbach has allowed recreational use of its timber properties for many years whenever fire hazard and safety of both public and employees near active logging operations has permitted. The company states that closure of selected areas has sometimes been necessary for these reasons, as well as the occasional threat of vandalism or theft of expensive logging equipment.

Other areas open to public hunting last fall included company tree farms in Clatsop, Columbia, and Tillamook Counties in Oregon, and Pacific, Clark, Wahkiakum, and Clallam Counties in Washington.

### St. Regis Fellowship to K. D. Ware

St. Regis Paper Company has announced the award of its fellowship in forestry to Kenneth D. Ware, a senior student in forestry at West Virginia University, Morgantown, W. Va. Ware will receive his B.S. degree in June and plans to continue his forestry education at Yale University in September. He will use his grant to study forestry management with a minor emphasis on industrial forestry.

This is the fourth St. Regis fellowship in forestry to be awarded to degree holders planning to take graduate work at any accredited school of forestry in the United States. Also for the fourth year, St. Regis offers five undergraduate scholarships in forestry.

### Gair Woodlands Again to Award Scholarships

Gair Woodlands Corporation of Savannah, Ga., announces that it will provide again in 1956 two forestry scholarships totalling $2,000.00 each. Each scholarship is for $500.00 per year for four years of study in forestry. The two outstanding high school students who receive the awards will be allowed to indicate their preference to attend the Forestry School of the University of Georgia, Athens; the University of Florida, Gainesville, Fla., or North Carolina State College, Raleigh, N. C.

In announcing these scholarships, T. W. Earle, president of Gair Woodlands Corp. said: "It is again my pleasure to announce that Gair Woodlands Corporation will offer two scholarships in the field of professional forestry, to two outstanding high school graduates, one from northeastern Florida, and one from southeastern Georgia or South Carolina. Forestry is a growing profession in the South, and it is our hope, through these scholarships, to attract and encourage capable high school graduates, from local communities, to enter the profession of forestry."

### Timber Company Changes Name

Robert D. Schultz of Vancouver, B. C. announces the formation of Robert Schultz & Company Limited, to succeed the Schultz Timber Company Limited, in the factoring of logs, sawmills, timber, shingles, shakes, and other forest products.

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MAKING FORESTLANDS SERVE AMERICA BETTER THROUGH GOOD MANAGEMENT

ALDO LEOPOLD (1886-1948), forester, author and originator of many basic wildlife management principles currently in use. His book, Game Management, (1933) is still considered outstanding in its field. He also helped pioneer the idea of managing forestlands for multiple use that is being applied by industrial foresters on tree farms all across the nation.

# tree farming...wise use and perpetuation of forest resources

*Naturally warm and beautiful, wood is the most popular building material. Perpetual supplies are being grown by tree farmers for use in lumber and other wood products.*

Providing a perpetual supply of forest raw materials is the primary goal of the nation's tree farmers. This is being done by growing timber as a crop, using proved forest management principles developed by foresters, scientists and resource specialists. One of the men whose research and work contributed much to modern forestry was Aldo Leopold, forester and wildlife authority. He stressed the importance of maintaining the natural balance that exists among soil, water, trees, weather and all of the things that live on the land. This broad concept of forest and land management is reflected in current tree farm practices.

More than 7,300 private owners have dedicated about 37 million acres of forestland as permanent tree farms. Their management plans carefully consider the relationship of tree-growing to many other factors, such as agriculture, wildlife, watersheds and public recreation. The result is *true conservation* through wise use and perpetuation of forest resources.

All Weyerhaeuser Timber Company forestlands are certified tree farms. *For more information about industrial tree farming, write us at Box A, Tacoma, Washington, requesting our free booklet, Promise of the Trees.*

## Weyerhaeuser Timber Company

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the forest industry in British Columbia for eleven years. He is a graduate of the College of Forestry, University of Washington.

Offices of the Company continue at 425 Howe Street, Vancouver 1, B. C.

### George Sears Joins Northeast Forestry Service

George Sears has resigned his position of assistant district forester with the Crossett Company, Crossett, Ark., to accept the position of forester in charge of the Chesapeake Division for the Northeast Forestry Service of Hawley, Pa.

Graduated from the New York State Ranger School and the College of Forestry, Sears worked with the New York State Conservation Department and for the past two years with the Crossett Company.

### Georgia Forester to Consultant Field

J. M. Tinker recently severed connections with the Standard Processing Company of Statesboro, Statesboro, Ga., to devote full time to consulting work. His headquarters will be in Statesboro.

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—*Teco photo.*

SENIOR AND GRADUATE students of the College of Forestry, State University of New York, Syracuse, and their instructors in forest utilization, Professors Harold B. Gatslick (extreme right) and Kenneth C. Compton (third from right), during a tour of the Timber Engineering Company laboratory in Washington, D. C.

The students were shown several practical applications of their classroom studies in wood technology. These included utilization of wood residuals, gluing and laminating techniques, evaluation of wood finishes, and testing timber connectors. Also of interest to the group were "Teco's" current investigations of ultrasonics as a new method of nondestructive testing of forest products.

### Hoskins Heads R.T.A. Conservation Committee

Robert N. Hoskins, industrial forester, Seaboard Air Line Railroad Co., has been named chairman of the Timber Conservation Committee of the Railway Tie Association, for the second consecutive year, according to announcement by Douglas Grymes, Jr., vice president of Koppers, Pittsburgh, president of the Association.

During the recent annual meeting this Association approved a three-point program prepared by Chairman Hoskins. This program included (1) intensification of conservation at grass-roots level through education and active participation by working through teachers of agricultural education throughout the nation; (2) achievement of better utilization through cooperation with other wood using industries and government agencies interested in forestry; and (3) promotion of safety in the woods.

## Education

### First Henry Schmitz Scholarships Awarded

The first Henry Schmitz Student Leadership Scholarships were awarded by the University of Minnesota School of Forestry at a recent student leadership recognition assembly to David W. Myhre, Battle Lake, and Lyle R. McCutchen, Carlos.

New scholarships were established in recognition of Dr. Henry Schmitz's many contributions to forestry. Now president of the University of Washington, he was head of the University of Minnesota School of Forestry from 1925 to 1947 and dean of the College of Agriculture, Forestry and Home Economics from 1947 to 1952.

Dr. Stanley Buckman, a 1931 graduate of the School of Forestry and once a student of Dr. Schmitz, established the fund for the Henry Schmitz Student Leadership Scholarships.

They will be awarded each year to students who have demonstrated outstanding leadership in the School of Forestry, who are considered leaders

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in college activities and who have maintained satisfactory scholarship records.

### A Textbook in the Economics of Forestry

To provide research assistance and defray other expenses of completing a college textbook in the economics of forestry, Resources for the Future, Inc., has granted funds through the State University of New York Research Foundation to William A. Duerr, chairman of the Department of Forest Economics in the University's College of Forestry at Syracuse. The grant is for a two-year period beginning in June 1956. During this period the textbook manuscript will be tested in class use, and Professor Duerr will seek advice and criticism from teachers and others associated with the growing field of forestry economics in the United States.

Professor Duerr is a past chairman of the S.A.F. Division of Forest Economics and Policy. He is co-editor of the book, *Research in the Economics of Forestry*, published in 1953 by the Charles Lathrop Pack Forestry Foundation and sponsored also by the Society of American Foresters; and author of *The Economic Problems of Forestry in the Appalachian Region*, which appeared in 1949.

### Stephen Austin Enlarges Forestry Staff

The appointment of a fifth member to the faculty of the Department of Forestry has been announced by President Paul L. Boynton of Stephen F. Austin State College. Robert D. Baker would assume duties as an assistant professor of forestry. He will handle work in valuation and finance, management, photogrammetry, and influences, and will conduct research in forestry problems affecting East Texas.

Baker goes to S.F.A. from the New York State College of Forestry at Syracuse, where he has served as an instructor of the forestry summer camp. He holds a bachelor's and a master's degree in forestry from the University of California, and has completed all of the requirements except the dissertation for the doctor's degree in forestry at New York State College of Forestry.

Baker will join a faculty headed by Arne K. Kemp. Other members of the faculty are Dr. Nelson T. Samson, Dr. Richard J. Wallace, and Ellis Hunt.

### Missouri Holds Retail Lumber Training Institute

The Forestry Department of the University of Missouri, Columbia, in cooperation with the Southwestern Lumbermen's Association held a "Retail Lumber Training Institute" from February 13 to March 2. The 34 students in attendance represented the states of Missouri, Arkansas, Kansas, Oklahoma, Colorado, Nebraska, and Mississippi. All were employees of retail lumber yards. Instruction covered a wide variety of subjects ranging from wood identification to merchandising techniques.

### G. W. Sharpe to University of Michigan

Grant W. Sharpe, formerly of the University of Washington faculty has recently become an assistant professor of forestry in the University of Michigan's School of Natural Resources.

His appointment was announced by Dean Stanley G. Fontanna of the School.

Professor Sharpe received bachelor's, master's, and Ph.D. degrees from


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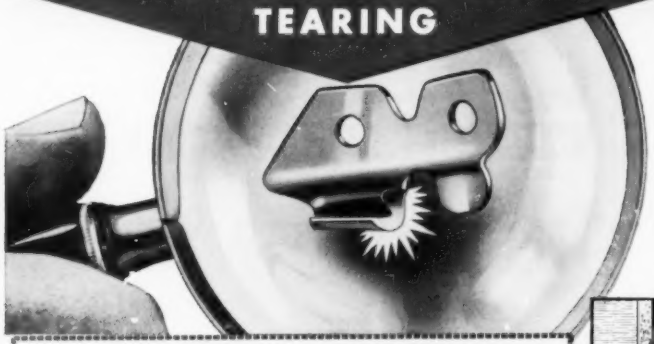

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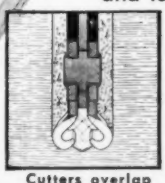

Cutters overlap and compliment the cutting action of each other.

Freer sawdust movement keeps the cut from packing to reduce friction and timberbind. An unusual self-feeding action insures easier cutting.

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the University of Washington.

His experience includes three years in the Navy, three summers as ranger naturalist, and nine months as park naturalist in the Glacier and Olympic National Parks. He developed for the Natural Park Service bulletins on the wild flowers of Glacier, Olympic, and Mt. Rainier National Parks.

"Professor Sharpe's training and experience gives him an excellent background for the teaching of dendrology and recreational use of wild lands, which will compose the major courses in his portfolio at the U-M," according to Dean Fontanna.

### Robert E. Dils Joins University of Michigan Staff

Robert E. Dils has joined the staff of the School of Natural Resources of the University of Michigan as associate professor of forestry in which capacity he will teach courses in forest soils and watershed management.

Dr. Dils taught at Michigan State University from 1947 until 1954, successively as instructor, assistant professor, and associate professor. His field of specialization is forest hydrology and in this field he has served as research forester at the Coweeta Hydrologic Laboratory and as collaborator for the Michigan Hydrologic Research Project of the Soil Conservation Service.

Dr. Dils received the B.S. and M.F. degrees in 1946 and 1947, respectively, from Colorado A & M College, and his Ph.D. degree from Michigan State University in 1952.

Dr. Dils has been a member of the Society of American Foresters since 1946, and has served as secretary-treasurer, vice chairman, and current chairman of the Division of Watershed Management.

During the period 1942-1945, he served as master sergeant in the Air Force Weather Service.

ROBERT E. DILLS

### Junior Logging Congress

The second Junior Logging Congress for Washington State high school students and advisors will be held at Pack Forest, thirty miles southeast of Tacoma, May 9-12.

The forest industries take a leading part along with state and federal agencies in sponsoring this educational program, which is patterned after the Junior Logging Congress in the Redwood Region.

The purpose of the J.L.C. is to acquaint advisors and older students with job opportunities in the woods and mills. Equal stress is given to the various types of work, whether college training is required or not.

Each boy is expected to pay his own way; however, a mill or logging company can sponsor local boys and assist in their expenses. Students and teachers arrange their own transporta-

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Shown here is freshly cut timber on its way to one of Koppers Wood-Treating Plants, where it will be pressure-treated with a chemical preservative to make it give decades of extra service.

CONSERVATION of our forests is a many-sided story, and there are many people "behind the scenes." For example, credit should go to the hunters who carefully extinguish their camp fires . . . and to the rangers who continuously scan the skies for the first sign of fire.

Then there are the Members of the American Tree Farm System. These Tree Farmers are wise in the ways of forestry. They grow crop after crop of trees on the same land.

Also vitally important in conserving lumber are the wood-treating plants—the places where wood is pressure-treated with chemical preservatives to make it give decades of *extra* service.

Koppers operates thirty-two wood-treating plants. In them, wood is protected against decay and insect attack. It can even be made fire-retardant. It is *always* made to last much longer. Yes, conservation and Koppers are synonymous.

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# Forestry Employment

**S.A.F. members are privileged to insert one 60-word advertisement in this column without charge. Forest industries desiring to employ foresters may insert advertisements at the rate of $4 per column inch. Copy must be received by the end of this month for an advertisement to appear in the issue after next.**

**Obviously, the Society cannot assume responsibility beyond making it possible for prospective employee and employer to enter into negotiations.**

## Positions Wanted

Forester, 25, B.S. Iowa State College, 1954; married; one child. Currently 1st Lt. USMC. Experience in insect control work one summer; 1½ years experience in earth moving, road building, heavy equipment maintenance and surveying with Marine Corps engineer battalion and base maintenance activities. Desire employment in Lake States or Northwest in forest products or engineering.
**Box B, Journal of Forestry, Mills Building, Washington 6, D.C.**

Forester, 35, B.S., 1948, married, 3 children; presently employed with large pulp and paper company with 8 years experience in public relations, acquisition, procurement and management. Desire relocation with private industry offering opportunity for advancement, preferably in south.
**Box C, Journal of Forestry, Mills Building, Washington 6, D. C.**

Forester, B.S.F., M.F., Univ. of Mich.; M.S. Agri. Economics, Iowa State. Ten years field work—Louisiana and Tennessee; 2 years teaching in accredited forestry school in South. Desire position in forest economics teaching or research by Sept. 15. Wide experience in working with students as well as forest owners. Will consider consultant work, administrative position, or technical assistance overseas.
**Box D, Journal of Forestry, Mills Building, Washington 6, D. C.**

Graduate forester, age 32, married, one child, 6 years excellent experience in pine pulpwood management and production. Would like to relocate with a lumber company, large or small, offering opportunity to learn all phases of the business from logging through retailing.
**Box E, Journal of Forestry, Mills Building, Washington 6, D. C.**

Forester, B.S., Univ. of Minn., Forestry, 1938; age 42, single. Disabled veteran. Need on-the-job training and experience. Two-years Jr. college lab. assistant; fuel-wood cutting lot; transportation-truck hauling and car delivery. Prefer employment in Minnesota or California.
**Box F, Journal of Forestry, Mills Building, Washington 6, D. C.**

Forester, B.S.F., Oregon State, 1951; age 30, married, 3 children. Now in Air Force as helicopter pilot; hold commercial ratings in single, multi-engine and helicopter. Available January 1957. 4 years engineering dept.; 1 year forest management dept. with large Northwest company; 1 year fire protection. Permanent employment in West or Northwest as Forester and/or Helicopter Pilot.
**Box G, Journal of Forestry, Mills Building, Washington 6, D. C.**

Forester, B.S.F., North Carolina State, 1950. Married. 4½ years experience with southern paper company; cruising and marking for pulpwood and sawtimber; cruising for land acquisition and cruising and marking for land management. Prefer work in the south or east.
**Box H, Journal of Forestry, Mills Building, Washington 6, D. C.**

Forester, age 37, B.S.F., M.F., 1947, Univ. of Mich. Married, two children. Nine years experience management multiple use forest, education and promotion. Desires position in South West or South East.
**Box I, Journal of Forestry, Mills Building, Washington 6, D. C.**

Forester, 26, B.S.F., 1953, Univ. of Mich. Married, one child. Presently serving as officer U.S. Navy. Desires position with private industry offering opportunity for experience and advancement. Available August.
**Box J, Journal of Forestry, Mills Building, Washington 6, D. C.**

Forester, B.S.F., 1951. Age 32, married, veteran, two children. Five years on forestry staff, large southern lumber firm. Experience: supervision of contract logging; commercial thinning; noncommercial T.S.I. program (hardwood removal); mapping; trespass; fire control; reforestation. Desires job with challenge, involving management and procurement with wood fiber or plywood industry. Prefer location in progressive community.
**Box K, Journal of Forestry, Mills Building, Washington 6, D. C.**

PROGRAM participants of the "Fifty Years of Forestry" program held at Oregon State College School of Forestry, Corvallis, Ore. on March 3, commemorating its golden anniversary. The speakers recounted fifty years of progress in forest management, engineering, and forest products and the next fifty years ahead in forestry education. The school was founded by George Wilcox Peavy, who served as dean until 1934.

From the left: Loran L. Stewart, Bohemia Lbr. Co., Cottage Grove, Ore.; Dean W. F. McCulloch, OSC School of Forestry; H. F. Thomas, Valsetz Lbr. Co., Portland, Ore.; Paul M. Dunn, St. Regis Paper Co., New York City; Henry Clepper, Society of American Foresters, Washington, D. C. *Photo courtesy The Lumberman.*

tion to and from Pack Forest.

The J.L.C. program consists of field trips to tree farms and logging operations, movies, lectures, and demonstrations on all phases of forestry. Each session is led by a trained forester.

Cooperating organizations include the State Office of Public Instruction, Washington State Division of Forestry, Washington Forest Fire Association, U.S. Forest Service, Weyerhaeuser Timber Company, Simpson Logging Company, and St. Paul and Tacoma Lumber Company. Don Flora, Keep Washington Green, Anderson Hall, University of Washington, Seattle, is heading up arrangements.

### Pennsylvania to Hold Sawmill Training Course

A small sawmill training course has been scheduled at the School of Forestry, The Pennsylvania State University, University Park, Pa. for August 29-31.

The course is designed to cover problems and discussion on the following subjects: Determination of profitable logs, choice of products to cut, relation of stumpage values to log size and grade, how to grade and scale logs, small mill equipment, economical use of men and machines, preventive maintenance and checks, selection and care of saws. Reduction of waste, power needs, lumber handling, seasoning problems, marketing, and other items. Mill demonstrations will be given at a local mill.

The fee is $15 for residents of Pennsylvania and $20 for nonresidents.

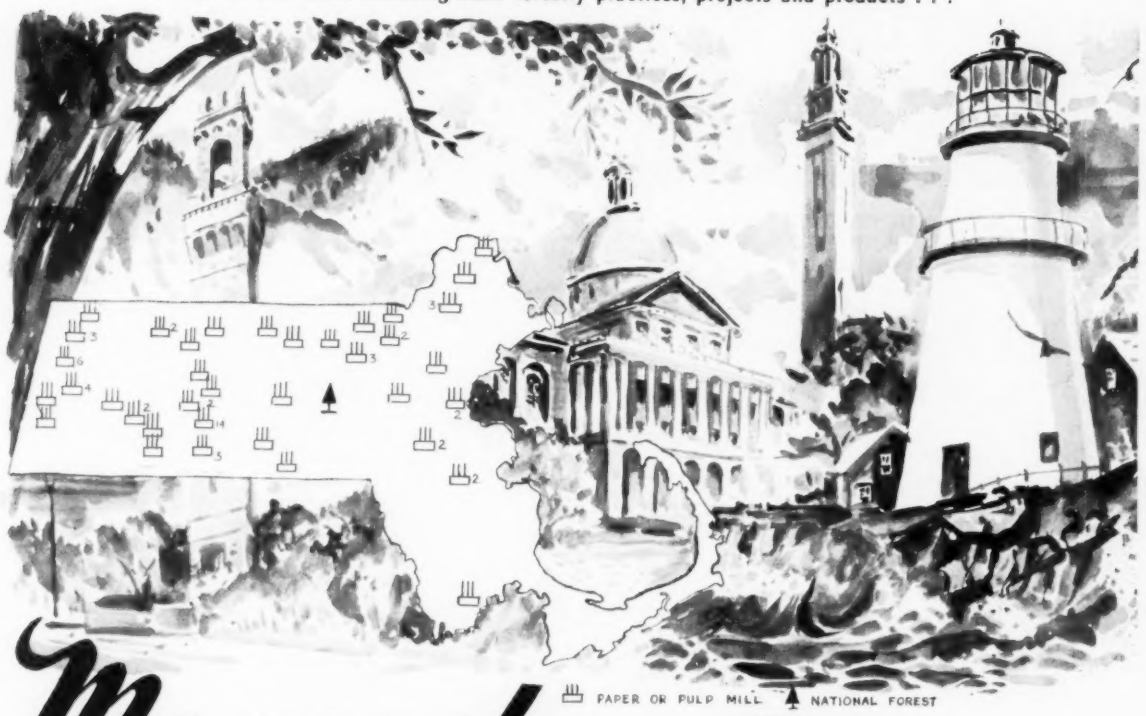
Application blanks may be obtained by writing:

Short Course Office
Dairy Building
The Pennsylvania State University
University Park, Pa.

If additional information is desired, write to:

Orvel A. Schmidt
School of Forestry
The Pennsylvania State University
University Park, Pa.

No. 19 of a series featuring state forestry practices, projects and products . . .




# Massachusetts educational regulations improve timber quality

Massachusetts records concern for its forests as early as 1626 when the Plymouth Colony passed an ordinance prohibiting cutting timber on colony lands without official consent. In 1631, the same colony felt settlers were too careless with woods fires and decreed a whipping for such carelessness.

Massachusetts today feels the same way about its forests. One of the nation's most heavily populated states, three-fifths of its five million acres is forested. Its wood-using industry is its sixth most important. One stationary sawmill has produced lumber for over 300 years under the same family ownership.

White Pine, the leading commercial species, cut for over 300 years, still grows faster than it is cut. However, the supply of quality lumber is declining. To combat this, Massachusetts, in 1943, became the second state to initiate a Forest Cutting Practices Law to regulate commercial logging. Although this is more a compulsory educational law than a regulatory one, the logging industry has given excellent cooperation. In twelve years, Massachusetts foresters have made cutting plans for 6000 logging jobs, for 1 billion board feet on 175,000 acres.

While most timber is cut to a minimum state standard, more and more woodlots cut only those paint-marked trees designated by a forester. Many owners now prune white pine to grow 95% clear lumber instead of the natural 5%.

3704 "wild fires" reported in Massachusetts during 1955 pose a major problem. Less than 3% of these cover over ½ acre, indicating prompt and aggressive suppression. Effective prevention, the real answer, is difficult in this extremely heavily populated state and results from every kind of prevention "tool" and "gimmick" are promising but far from satisfactory. It is hoped that, like the rolling snowball, prevention efforts will grow until impact on the public is too impressive to disregard.

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## Public

### Forest Service Announces Shrifts in Key Personnel

Carl A. Gustafson, chief of the Division of Fire Control since October 1948, has been named general inspector for the Washington office of the Forest Service.

He will be succeeded by Merle S. Lowden, since 1951 assistant regional forester in charge of state and private forest land activities in the North Central Region, headquartered at Milwaukee, Wis. James K. Vessey, assistant regional forester in charge of information and education for the Northern Region at Missoula, Mont., since 1950, succeeds Lowden. All transfers took place early in April.

Gustafson in his new position will inspect all phases of Forest Service activities in field units to coordinate their work with national programs. He has been with the Forest Service since 1927, serving as ranger, assistant supervisor, supervisor, and associate forester in western regions before taking his present job. He received his B.S. degree from the University of Idaho in 1927 and his master's degree in forestry from the University of California in 1929.

Mr. Lowden will head up all fire control activities on the 150 national forests. This includes also fire detection, training of aerial and ground fire fighting crews, and the development of fire fighting equipment. He was first employed by the Forest Service in 1934 after receiving his B.S. and master's degrees in forestry from Oregon State College in 1932 and 1933. He worked in the Northwest before going to Milwaukee.

Mr. Vessey will be in charge of Forest Service participation in cooperative fire, tree planting, and on-the-ground technical assistance programs with state agencies and private timberland owners in North Dakota, Wisconsin, Minnesota, Missouri, Iowa, Illinois, Indiana, Ohio, and Michigan. He received his B.S. degree from Pennsylvania State College in 1925, joined the Forest Service in 1933, and worked in the East before going to Montana.

### Hansbrough Promoted Chief of Forest Disease Research

John R. Hansbrough has been appointed chief of the U. S. Forest

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*Protection—Reforestation—Inventory*
*Utilization—Research*
Verne D. Bronson, Chief forester, Phone 5-5371

Service's Division of Forest Disease Research, succeeding Lee M. Hutchins, who has retired.

Dr. Hansbrough had been chief of the Northeastern Forest Experiment Station, division of forest disease research.

Dr. Hansbrough has served with the Forest Service since December 1953, when a Department of Agriculture reorganization transferred forest disease research to the Forest Service. Prior to that, he was in charge of the forest pathology laboratory at New Haven, Conn., which was maintained by the Bureau of Plant Industry, Soils, and Agricultural Engineering.

## Disease Research Chief Retires from Forest Service

Lee M. Hutchins retired from the position of chief of the Division of Forest Disease Research of the U. S. Forest Service in December 1955. He first became a member of the Service in 1953 when this work was transferred from the Bureau of Plant Industry, Soils and Agricultural Engineering. He had been a member of the Department of Agriculture since 1913 except for World War I service as a Medical Corps bacteriologist.

Following his retirement, Dr. Hutchins left for Yugoslavia in March on an F.A.O. assignment to investigate virus diseases of trees.

Dr. Hutchins first worked with the Bureau of Plant Industry in the field of fruit tree diseases, but in 1941 became head of the then Division of Forest Pathology. Among activities that have been particularly advanced under his leadership have been recognition by foresters of the importance of tree diseases, the development of varieties of elm resistant to phloem necrosis and of mimosa resistant to wilt, effective aid to five Mediterranean countries in meeting the threat of chestnut blight, and the evaluation of, and practical measures for decreasing, heavy pulpwood loss in storage from decay.

In June of 1955 Dr. Hutchins received the Department of Agriculture Superior Service Award and the Alumni Award for Distinguished Service from Michigan State University. He graduated from the former in 1913, receiving his Ph.D. from Johns Hopkins in 1924. Author of numerous scientific publications, Dr. Hutchins is a Fellow of the A.A.A.S. and past president of the American Phytopathological Society.

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### Willliam A. Dayton Retires from Forest Service

After 45 years with the U. S. Forest Service, William A. Dayton retired in December, 1955 but will be retained as a collaborator.

Mr. Dayton entered the Forest Service as a plant ecologist in 1910. In 1914 he was transferred to the Washington office and placed in charge of range forage investigations. In 1942 he was made chief of the Division of Dendrology and Range Forage Investigations.

Mr. Dayton has won wide recognition as an international authority for his original research and leadership in taxonomy, ecology, phylogeny, and economic value of grasses, browse plants, trees, and related forest and range vegetation. He pioneered in range forage investigations and is credited with having done more than any other one individual to systematize the nomenclature of range plants. He started and has subsequently been responsible for building up the Forest Service Range Plant Herbarium, which now consists of more than 110,000 specimens. He is author of "Important Western Browse Plants" and "Range Plant Handbook" and numerous other Department of Agriculture articles and reports. He is co-author of *Standardized Plant Names*, standard nomenclature reference, and was chairman of the Forest Service Tree and Range Plant Name Committee which prepared the *Check List of Native and Naturalized Trees of the United States*.

Mr. Dayton is a Fellow of the A.A.A.S., is currently chairman of the S.A.F. Tree Name Committee and is a member of some 20 other scientific societies. He received his B.A. degree from Williams College in 1905 and his M.A. from the same college in 1908.

### Prominent Forest Entomologist Retires

The U. S. Forest Service has announced the December, 1955 retirement of Frederick P. Keen, forest entomologist of the California Forest and Range Experiment Station. Mr. Keen is widely known for his "Insect Enemies of Western Forests" and his tree classification for ponderosa pine. He has received the Department of Agriculture Superior Service Award (1946), the Western Forestry and Conservation Association's award for distinguished services in the field of forestry (1953); the American Forestry Association's distinguished service award for accomplishment in the field of forest entomology (1954); and was elected a Fellow of the S.A.F. in 1955.

Mr. Keen joined the Bureau of Entomology in 1914, following graduation from the University of California that year. Except for service as an Army lieutenant in World War I, he remained with the Bureau until its transfer to the Forest Service in 1953. Beside the S.A.F., Mr. Keen is a member of the Entomological Society of America, the Pacific Coast Entomological Society, and is a Fellow in the American Association for the Advancement of Science.

### Mays and Prater Transfers Announced

Lawrence K. Mays, who has been in charge of the Division of Operation of the Pacific Northwest Region since 1948, has been transferred to the Southern Region as assistant regional forester. He has been replaced by P. F. Wallace Prater, who has been in charge of the Division of Operation in the Southern Region since 1952.

Mays recently completed a six-month assignment to the Washington office where he worked on problems con-

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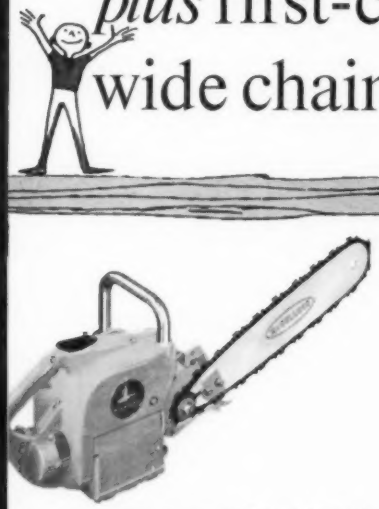

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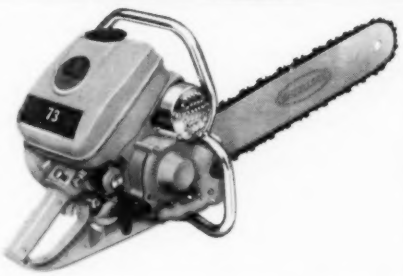

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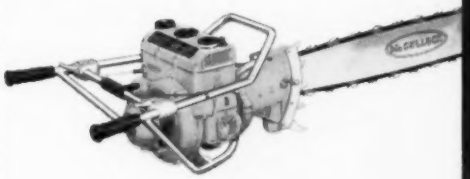

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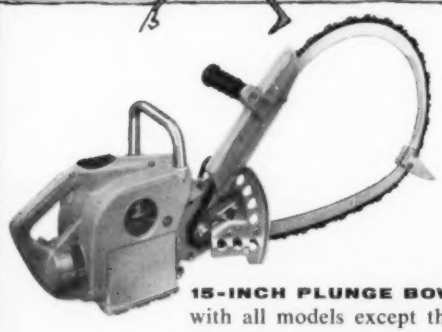

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nected with organization and financing of Forest Service regional offices. From 1940 to 1952 Prater was in charge of personnel management in the regional headquarters of the Southern Region.

### Clarence Strong on Afghanistan Assignment

From Kabul, Afghanistan comes word that Clarence C. Strong, who is on a technical assistance mission in that country, has recently been transferred from the Helmand Valley area to the capitol. He serves as advisor to the Ministry of Agriculture in the development of a more adequate forestry program for the country. Afghanistan currently has only one man working in forestry who has had professional training. Plans call for the gradual development of a nucleus of trained foresters to lead work in a forest survey, forest research, education in forestry in the newly organized College of Agriculture, country-wide general education in forestry, extension and farm forestry, and protection from overgrazing, insects, disease, and fire.

Strong will return to the United States in the autumn of 1956.

### W. G. Guernsey Completes 31-Year Federal Career

William G. Guernsey, special assistant to the director, Bureau of Land Management, retired in March after more than 31 years of federal service, to enter private business in Boise, Idaho.

B.L.M. Director Edward Woozley commended the former associate director for his assistance in the important task of reorganizing the Bureau. "Mr. Guernsey," Woozley said, "was instrumental in carrying out the rather sweeping changes recommended by the Secretary's Survey Team, particularly bringing together the five technical programs and coordinating them into an effective team. He is now eligible for retirement and we wish him every success in his future endeavors."

Guernsey commenced his career with the federal government in 1923 in blister rust control work with the Forest Service at Spokane, Wash. He eventually became assistant regional forester of the Intermountain Region. In August, 1953 he transferred to the B.L.M. as regional administrator at Portland. He was reassigned to the position of assistant director, Washington, D. C. in March, 1954; to associate director in June; and in August, 1955 he became special assistant to the director, which position he occupied at the time of his retirement.

Guernsey graduated in 1929 from the University of Idaho. His military service record includes two tours of duty with the Navy in 1919-1921 and 1941-1945. He has been a Commander in the Naval Reserve.

### W. E. Miller Joins Lake States Station

Dr. William E. Miller of New Orleans, La., has been appointed as entomologist on the staff of the Lake States Forest Experiment Station, according to an announcement by M. B. Dickerman, director of the Station.

Dr. Miller will be located at the East Lansing, Mich., field office of the Lake States Station and will work under the direction of H. J. MacAloney, chief of the Station's Forest Insect Division. He graduated from Louisiana State University and was granted his Ph.D. degree in entomology at Ohio State University. He has just completed two years' service with the U. S. Army in the Communicable Disease Division of the Walter Reed Institute of Research.

## Products & Equipment

### McCulloch Motors and Scott-Atwater Merge

Merger of McCulloch Motors Corporation, Los Angeles, and Scott-Atwater Manufacturing Company, Minneapolis, to form a fifty million dollar a year combination under McCulloch Motors' direction has been announced.

McCulloch is one of the world's largest builders of chain saws. They also manufacture other products involving gasoline engines. Scott-Atwater is one of the largest producers of outboard motors.

Scott-Atwater, which will function as a wholly owned subsidiary of McCulloch Motors, will continue under the same management. Products, personnel, and distribution will remain unchanged.

McCulloch Motors, a closed corporation, has increased its sales more than 500 percent since its entry into the chain saw business in 1948. For Scott-Atwater this move will make available the capital necessary for its continued growth. The company has increased its sales of outboard motors by more than 200 percent in the past three years.

This Caterpillar D4 Tractor with Mathis plow, severing roots cleanly, cuts a fireline 8 feet wide and 10 inches deep in the Orangeburg District, South Carolina.

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Here you see the D4-Mathis team plowing a fireline 8 feet wide and about 10 inches deep. It cuts roots from 4 to 6 inches thick, severing them cleanly. When used fighting a fire, it has the capacity to do the work of more than a hundred men. Like all Caterpillar equipment, it has the stamina to keep working under the toughest going.

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